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The
Geographical Journal.

No. 1. JULY, 1903. Vol. XXII.

ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY, 1903.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President.

It is, I think, very satisfactory to find that the Society, year by year, continues to flourish and to increase the number of its members; and that, in spite of the diminution of income caused by our large grant to the Antarctic Expedition, our means of usefulness have not been materially reduced. I feel very strongly that our flourishing condition is due, in no small measure, to the efficiency and excellence of the Society's staff; and, first and foremost, to the admirable way in which the *Journal* is edited by our Secretary. The new series has now reached its twentieth volume, covering the period from 1893 to 1903. In my anniversary address for 1894, I was already able to record that it was quoted everywhere; that it was favourably noticed by the principal organs of the press; and, above all, that it was highly commended by the celebrated German geographer Baron von Richthofen, than whom there is no better judge. Since that time the *Journal* may truly be said to have improved from year to year. It is now the chief repository of geographical information from all parts of the world. It contains original maps, such as that of the Congo and those of the Kangchenjunga, of the utmost value; and the numerous illustrations have largely increased its popularity and usefulness. Such excellence could not be reached without corresponding expenditure; but this is met, to some extent, by receipts from advertisements. The Society owes the high position held by our *Journal* to the ability and untiring labour of its accomplished Secretary, Dr. Scott Keltie. As for his other work for the Society, there are few Fellows who have not personal knowledge and experience of his unfailing courtesy, his indefatigable industry, and his sound judgment in all matters relating to our

* Read at the Anniversary Meeting, May 18, 1903.

work. The Council places the highest value on the way in which the Society's business is conducted by Dr. Keltie; and for myself personally I can say with truth that the President is relieved of half his labours, and of all his anxieties, by the perfect confidence he is able to place in the ability and zealous work of the Secretary. Dr. Keltie enters upon every new project for the advancement of geography and for the increased usefulness of the Society's operations with an amount of zeal and intelligence that cannot easily be surpassed. It is, however, only those who are daily working with him that can know the full extent of the good that he accomplishes.

The Society is, at the present time, very fortunate in having the services of such an excellent staff. In Mr. Heawood we have a librarian who possesses no ordinary knowledge of geographical literature, and who takes a keen interest in completing our library and in making it as useful and accessible as possible to the Fellows. Mr. Reeves has had an experience of our map-room extending over a quarter of a century. His qualifications as curator are, therefore, unequalled. But it is for his success as an instructor that the Society is most indebted to him. Mr. Reeves combines a profound knowledge of his subject with rare gifts of exposition, and I hear on all hands that his system of instruction gives the greatest satisfaction to those who benefit from it. The number of students has greatly increased. During the past year sixty-four students have passed through Mr. Reeves' hands, and four have succeeded in obtaining the Society's diploma. Mr. Evis, our chief clerk and accountant, has now been in our service for thirty-seven years, and has held his present post for twenty years. I have always looked upon him as a model of efficiency, and as one in whom the most complete reliance can be placed.

Our service is liked, and members of our staff do not care to leave it. One of them has served us for upwards of fifty years. The junior members of it are efficient and zealous, and all pull well together. I have been struck by this on several occasions. Quite recently, on the occasion of our Elizabethan Exhibition, all the arrangements were ably and admirably conducted, without a mistake, with excellent taste, and without a complaint.

In my address last year I referred to the action taken by the Council, in resolving that there should be a Special Education Committee to deal with communications from the London School Board and the Oxford and Cambridge Local Examination Board. This committee has considered the subject of geographical education at several sittings, and has drawn up two syllabuses for the guidance of teachers of geography, one dealing with elementary education, and the other with secondary education. It is hoped that these syllabuses will be issued shortly, and that they will tend to place our science on a clear and satisfactory basis both in elementary and secondary schools.

In other directions during the past year evidences of the increasing interest in geography as an educational subject have been manifest. Urgent inquiries are received at the Society's rooms as to where good geographical teachers can be found, or asking for guidance or advice as to methods and appliances, maps and text-books. It is to be hoped that in the re-organization of education, which is on foot in this country, provision for the adequate training of teachers in geography will be made, as is the case with other subjects. More than one of our public schools is known to be equipping itself for the more thorough teaching of geography by the purchase of orographical maps, and in other ways. It may further be noted, as a sign of the movement in progress, that a course of lectures on the teaching of geography was recently delivered in Leeds, at the instance of the West Riding County Council, and was attended by more than eight hundred experienced teachers from secondary and primary schools.

The position of geography in the Universities continues to be hopeful. The arrangements for the school at Oxford are in all respects satisfactory, and there at last we see our long-continued efforts bearing fruit. At the regular courses, during the past year, there has been an attendance of nearly one hundred and fifty students. In addition, a most successful vacation course has been held, which was followed by more than twenty teachers, nearly all graduates. A "certificate in geography" has been established by the University to meet the needs of those who cannot spare the time required for a Diploma. There is now a distinct prospect of an important step forward being taken at Cambridge. On this I cannot say more at present, but I am not without hope that before the close of the year geography at Cambridge will at last be on a satisfactory footing. The Reader at Cambridge, Mr. Yule Oldham, has, meanwhile, given courses of lectures on the geography of Europe, showing the influence of physical features on national development, which were attended by thirty students in the Michaelmas and forty-one in the Lent term. He has also given lectures on the principles of physical geography, less numerously attended, and on the history of geographical discovery. Altogether he had over ninety students attending his lectures during last term. Mr. Yule Oldham has also organized fortnightly evening meetings, on the model of a German "Colloquium," at which original papers have been read by selected students.

I was able to report to you last year that geography had been placed on a proper footing in the reconstituted University of London. Among other arrangements, it has been included in the optional subjects in the matriculation examination. The programme of the subjects for this examination was in every respect satisfactory, placing geography on a level worthy of a university. The first examination has been held under this programme, and the paper was a stiff one. The number of candidates was sixty-six, but the result was not

altogether satisfactory, though not surprising on the first beginning; for the examination made a demand on powers of observation and reasoning to which pupils in this country have not been accustomed. There is every reason to expect that, in time, both teachers and pupils will rise to the standard. In the London University large classes have attended the geographical courses at the School of Economics, one of them containing nearly twenty graduates. The first intermediate examination for the degree of B.Sc. in economics is about to take place, with geography as one of the obligatory subjects.

It will be remembered that in 1894 I introduced the plan of printing, with the general list of Fellows, a list of those who have read papers, published books, or are known to have a special knowledge of any department of our science, which I called a List of Referees, because papers or questions can be advantageously referred to them for report. This list has annually been corrected and revised. It was thought that it would be the ambition of younger Fellows to qualify themselves for inclusion in the list; and in other ways I hoped that the plan would have a tendency to draw the Fellows more together, and into nearer touch with the Council. This has been the case to some extent, but not to the extent I hoped.

With a somewhat similar intention, I instituted the plan of having afternoon meetings in our map-room, for the reading and discussion of strictly scientific or technical papers at a time and place where there could be special audiences and full discussions. The afternoon meetings were commenced in November, 1894, and twenty-three papers have since been read. Some of them, such as Prof. Rücker's on terrestrial magnetism, Dr. Gregory's on the age of the Atlantic, Mr. Vaughan Cornish's on the formation of sand-dunes, Sir John Farquharson's on the Ordnance Survey, Mr. Bernacchi's on the great ice-barrier, and those by M. Elisée Reclus, were important, and were followed by interesting discussions. The plan proved to be useful and capable of further development, and I think that the time is now ripe for organizing and systematizing these afternoon meetings with a view to the promotion of geographical research in various directions, under the supervision of those who would be best qualified to undertake such a task.

From the commencement of our Society its Councils have maintained that the field of geography embraces, not only expeditions for discovery and exploration by sea and land, but also research in various directions, both in the study and in the field. Any one looking back through the volumes of the old *Journal* and *Proceedings* will find not a few papers dealing with investigations, as distinguished from exploration. Our traditions, therefore, authorize us to give special encouragement to geographical research, both in its purely scientific and in its practical aspects.

Mainly through the continued activity of the Society during the last twenty-five years, a school of young geographers has grown up, who are carrying out researches in various departments of our science, and who are thus helping to raise the standard of geography in this country. It seems the duty of the Society to do what it can to encourage work of this kind, and to invite those who are taking part in it to lay their results before the Society. This has, hitherto, been done to some extent at the afternoon meetings, and it is now only necessary to introduce a more organized procedure, so that there may be a regular supply of suitable papers. If the meetings are arranged at fixed dates, it will be possible to obtain an audience capable of discussing each subject that is brought forward.

A permanent committee has now been appointed to deal with this department of the work of the Society, to be called the "Research Committee." It will consist of those Fellows, taken from the List of Referees, who are most interested in, and best qualified to deal with, the subjects which are embraced in geographical research, as distinguished from exploration, in all its numerous branches. It is intended that the committee shall be a large one, and shall include the more distinguished students and men of science among our Fellows, as well as the members of our Council *ex officio*. The committee will meet for the discussion of such results of investigation as may be brought before them; and the Council may be able to set apart a moderate sum each year for the purpose of encouraging such researches among the younger geographical aspirants.

Among the numerous lines that research may take, the following have been suggested:—

New methods of surveying, mapping, or computing,

Discussion of a definite problem of geomorphology (*e.g.* analysis of a river system or a coast-line).

Discussion of a definite problem of hydrography (*e.g.* circulation of water in a restricted sea area).

Discussion of a definite problem of meteorology (*e.g.* modifications of general weather conditions by local features).

Regional studies (*e.g.* synthesis of the geography of a county or of a natural unit such as the Fens).

Investigation of distribution (*e.g.* of some crop in relation to natural facilities and access to markets; of former forests in relation to existing boundaries; of village and town sites in a district).

Mapping of distribution of plant associations in a given area, or of a human disease in relation to climate and soil.

History of the map of some country (*e.g.* the British Isles).

Investigation of evidence of physical changes within historical times (*e.g.* the British coasts; the desiccation of continents).

Discussion of the relation of land forms to military movements in a selected area, or a chosen campaign.

Discussion of the relation of land forms to the distribution of man; to the distribution of animals in any area.

Geographical conditions affecting the development and colonization of any given region.

Complete investigations from the geographical standpoint of a limited area of unexplored or partially explored territory.

There is still ample room for exploration and expeditions of discovery. We have scarcely yet laid down the great lines of the world's geography, and there is work for generations to come in filling in the details, though future exploration must become more and more exact and scientific in its character. But we ought also to encourage research, for which exploration furnishes the raw material. By the plan now in contemplation, we shall develop the purposes of the List of Referees by constituting the Research Committee; and we shall develop further the object of the afternoon meetings by promoting research, the results of which will place the meetings on a more assured and regular system, by creating the necessity for their being more frequent and at fixed intervals.

Turning from our own efforts for the advancement of geography, to the labours of our associates and friends in the field during the past year, I would first refer to the expedition under our Vice-President, Sir Thomas Holdich, from which many interesting and important results may be expected. Last year Sir Thomas went for a second time to the Patagonian Andes in connection with the delimitation of boundaries between the Argentine Republic and Chile. We may expect to have an account of the results of his researches at one of our meetings next session. Our associate, Mr. Hanbury, has lately returned from an exploration along the arctic shores of North America, and in the inhospitable region to the south. He has brought back much valuable material. The devastating eruptions in the West Indies afforded an opportunity for investigating volcanic phenomena, of which excellent advantage was taken by Dr. Tempest Anderson and Dr. Flett. The results were given to the Society during the present session.

In Africa the explorers of all nations are as busy as ever. I may make special reference to the geodetic expedition led by Dr. Rubin, under the supervision of Sir David Gill, which is to carry the measurement of a meridian north from the Zambezi. Another important expedition in Africa was that of M. du Bourg de Bozas, which has been doing admirable work in the Nile region, and was making its way westward to the Atlantic when its accomplished but unfortunate leader died. In Asia and in Australia the work of exploration is being carried out with increasing activity, and with more and more attention to scientific method.

Oceanography is attracting increased attention. The International Council for the investigation of fishery and other problems is superintending excellent work in the North sea and the Atlantic. Prof. Agassiz may be said to have completed his many years of research of coral islands and coral reefs. The results are being published in a series of handsome volumes, most creditable to the public spirit and scientific knowledge of the accomplished professor. The committee appointed at the last International Congress on the terminology and nomenclature of sub-oceanic forms met recently, and the results of their deliberations will doubtless be of service to students.

In our own country the survey of the lakes of Scotland, carried out by the joint enterprise of Sir John Murray and Mr. Lawrence Pullar, has been making rapid progress; and it is hoped that the first result, in the form of maps and reports, will be given in our *Journal* in the course of a month or two.

We now come to the two most memorable events of the past year, and of many past years, one in the far north, and the other in the far south.

Captain Sverdrup, in completing our knowledge of the Parry archipelago, has also completed our general knowledge of Arctic geography. It is this completeness which is the distinguishing feature of his great achievement. In Nansen's famous vessel the *Fram*, he left Christiania in 1898, and continued his operations for no less than four years and a quarter. He had with him a party of a dozen resolute, capable, and able-bodied explorers, including three men of science, a naval officer, and a cavalry officer who was a good surveyor. Sverdrup is an experienced Arctic voyager, a thorough seaman, a man of great resolution, an excellent organizer, and a good comrade. His people worked well with him, and in harmony with each other to the end. The consequence was that he succeeded in completing a fine piece of geographical work, for which he and his gallant companions deserve our highest commendation.

Sverdrup's original object was the exploration of the northern shores of Greenland, but very unfavourable seasons prevented him from proceeding up Smith Sound.* He, however, cleared up the question respecting Hayes Sound, which was still doubtful, and proved that it

* The land which is divided from Greenland by Smith Sound forms a long island, and as many as seven names have been given to various parts of it—

1. North Lincoln.
2. Ellesmere Land.
3. King Oscar Land.
4. Schley Land.
5. Arthur Land.
6. Grinnell Land.
7. Grant Land.

It is a geographical necessity that, for purposes of description, there should be a name for the whole island. It was first discovered by Baffin in 1616, and first named Ellesmere by Inglefield in 1853. Its name should, therefore, be Ellesmere Island.

was a bay. His parties crossed the land to the westward by two routes. He then turned his attention to the region for which Jones Sound is the opening, where his great success awaited him.

The northern coasts of the islands whose southern coasts were first seen by Sir Edward Parry in 1819 were discovered by Sherard Osborn and Richards in 1853, while Prince Patrick Island, the westernmost of all, was explored by McClintoch and Mecham in the same year. The northern coast of Ellesmere Island was discovered by the present Admiral Aldrich in 1876. There remained a wide gap between Prince Patrick Island and Aldrich's furthest, which could be approached by Jones Sound. Owing to the light character of the ice on the northern shores of North Devon, Bathurst and Melville Islands, and to islands, which were named Findlay and North Cornwall, having been seen to the northward, we always assumed that there must be yet more land to the northward. On the northern coast of that land we expected that there would be heavy ice-pressure, similar to that seen on the north coast of Ellesmere Island and on the western coasts of Banks and Prince Patrick Islands. Thus the discovery of what is contained in this wide gap between Prince Patrick Island and Aldrich's furthest would complete our knowledge of the Parry Archipelago, the most interesting part of the Arctic Regions, and would complete our knowledge of the line of mighty ice-pressure from the polar ocean, extending from Point Barrow to the east coast of Greenland.

This great geographical achievement has been done by Captain Sverdrup and his gallant companions. He has discovered both shores of Jones Sound westward of the furthest point reached by Sir Horatio Austin in 1851. He has discovered the whole of the western side of Ellesmere Island, with its numerous deep fjords, the shores of some of which are of great geological interest. His most northern point was within 40 miles of Aldrich's furthest. He discovered a long island separated by a strait from Ellesmere Island, which he named Axel Heiberg, after one of the munificent promoters of the expedition. His comrade, Gunnar Isachsen, discovered the two large islands which we assumed to exist north of Bathurst Island, extending westward beyond the meridian of the eastern coast of Melville Island. They were named the Ringnes Islands, after the two other promoters of the expedition. The expected heavy ice was pressing on the northern coasts of the newly discovered lands.

The discoveries were made by means of dogs over ice suitable for dog-sledging, and with abundant fresh food.

The gap, which I had longed to see undertaken, has thus at length been filled up. On either side are the English discoveries with English names, while wedged between them are the Norse discoveries and the Norse names in the gap, names reminding us of the old West Bygd and East Bygd of Greenland. This interlacing of Norwegian and English

discoveries, and of Norwegian and English names, is emblematic of kindred origins, and of the close ties of friendship uniting the two nations.

I repeat that one of the great merits of the work of Sverdrup and his gallant companions is its thoroughness and completeness. It was no small pleasure to me that it became my duty to present Sverdrup with the royal medal, while his accomplished comrade Isachsen has received one of our awards.

We are at last able to contemplate the vast Parry Archipelago as a whole. It is a region of great interest, from many points of view. Opposite to the west coast of Greenland, separated by Baffin's Bay and Smith Sound, there are three Islands of considerable size—Baffin Island, North Devon Island, and Ellesmere Island. The eastern sides of these islands are composed of primitive rock, are glaciated, and resemble Greenland in several respects. But to the westward there is a great change, where a vast area is covered by the Parry Archipelago, consisting of fourteen large islands, many small islands, and a peninsula. To the south there are three large islands separated by straits from the North American Continent, namely, Banks Island, Wollaston Island,* and King William Island. The Boothia Peninsula may be included. Then come Prince of Wales and North Somerset Islands. Occupying a central position are North Devon, Cornwallis, Bathurst, Byam Martin, Melville, Eglinton, and Prince Patrick Islands. To the north are the Ringnes and Axel Heiberg Islands.

These islands differ from the Greenland region in having no glaciers. There must be much less precipitation, and all the meteorological conditions are of very special interest. Their geological formations are even more interesting. In some parts there are extensive Silurian beds very rich in fossils, then Carboniferous sandstones with coal, and limestones. The Mesozoic period is represented by Liassic saurians and other fossils, and the Tertiary by a rich fossil flora in the northern part of the area. One interesting problem is connected with the remains of trees—large trunks which have been found in Banks and Prince Patrick Islands, as well as in the western fjords of Ellesmere Island. Authorities differ respecting their origin: Sir Roderick Murchison was inclined to the view that they were driftwood, others maintain that the trees grew *in situ* at a comparatively recent period, while Mr. Schei of the Sverdrup Expedition thinks that the tree-trunks belong to the Tertiary period. There are many other problems in the geology and physical geography of the archipelago of great interest, especially those relating to the granite boulders far from their original sites, to the different levels

* This island, like Ellesmere Island, has suffered from a plethora of names. One part is called Prince Albert, another Victoria, another Wollaston. A name for the whole island is a geographical need, and it seems to be best entitled to that of Wollaston Island.

of the land, to the character and depth of the channels, the ice-movements and currents, and the position of the still water where the tides of the two oceans meet. The fauna and flora are dependent largely on the character of the rock formations, and the amount of precipitation, as regards distribution, and this is another subject of study. Then there is the mysterious people who, at some remote period, traversed the whole archipelago except the extreme outer western and northern shores, and left numerous vestiges. Here, too, are the scenes of the most famous deeds of Arctic exploration. The greatest voyage with the aid of steam was made by the *Alert* under Sir George Nares; for she alone has battled with the palæocrystic ice, and thus wintered further north than any other ship ever has, or probably ever will, apart from the *Fram* drifting. But the greatest voyages of sailing ships among the ice of the Arctic Regions were undoubtedly those of Parry in 1819–20, and Franklin in 1845–46. In the Parry Archipelago, too, the greatest feats of Arctic sledge travelling have been performed. Here McClintock and Mecham, without the aid of dogs, were away 105 and 94 days, and went over 1328 and 1163 miles respectively. Here Mecham went over 1336 miles at the rate of 20 miles a day. Such work as this has never even been approached in any other part of the north, and I do not think that it ever will be. These journeys would have taken the explorers from Cape Fligely to the north pole and back with ease, and without the aid of dogs.

Thus the Parry Archipelago, from many points of view, presents subjects for study of the greatest interest. Now that Sverdrup's discoveries have completed the work in the field, the raw material is all collected, and offers a splendid subject for geographical research.

Captain Peary has, in the face of extraordinary difficulties, succeeded in reaching the extreme northern point of Greenland, the most northern land in the world, in 83° 20′, and even travelled for three days to the south east. This completes another important Arctic discovery. Baron Toll is still engaged on his work of exploration to the north of Siberia.

The whole problem of Arctic geography has now been solved. There are many isolated pieces of work that I should like to see undertaken. One of them has been entered upon by Captain Amundsen, who is just about to commence his daring voyage, in a very small vessel, to the north magnetic pole. Our Council has had pleasure in subscribing to his fund. Others may be attempted in future years. But there are none which would justify the despatch of an expedition on a large scale.

We will give our final attention to the Antarctic Regions, and, before referring to our own great work—which, indeed, will require a separate address to the Fellows of the Society—we must turn to what is being done in the Weddell and Enderby Quadrants.

I had the great pleasure of wishing Dr. Otto Nordenskiöld Godspeed when he started on his expedition on October, 1901. The *Antarctic*, with that experienced polar navigator Captain Larsen in

command, finally left Falmouth on October 26. She visited the Argentine magnetic observatory on Staten Island on January 6, 1902, and sighted one of the South Shetland Islands on the 11th. From the 12th to the 21st of February, 1902, the *Antarctic* was engaged in landing Dr. Nordenskiöld and a small party at the northern end of Graham Island at Admiralty Inlet, Snow Hill Land, south of Cockburn Island (Louis Philippe Land). Here he wintered, and intended to do some sledging work in the spring, but he was 250 miles north of the antarctic circle, by the coast. The *Antarctic* was back at the Falkland Islands by March, and visited South Georgia in the winter. In February, 1903, it was expected that the ship, after returning to the winter quarters and taking Dr. Nordenskiöld and his party on board, would return to the Falkland Islands. But she has not appeared, and some anxiety is felt in consequence. I understood that it is intended to send out a relief ship. I most sincerely trust that all may yet be well with the gallant Swedish explorers.

Mr. Bruce completed his arrangements for an expedition into the Weddell Quadrant last year. He purchased an old Norwegian whaler named the *Hecla*, built in 1872, 139 feet long by 29, and of 355 tons burden, at Sandefjord. I had twice inspected her, and found that she would require very extensive repairs before she could be made fit for ice-navigation. These, it is understood, she has received in the Clyde, and her name was changed to the *Scotia*. Captain Robertson, an experienced whaling captain, is in command, and Mr. Bruce is leader of the expedition. The scientific staff consists of Mr. Mossman, meteorologist; Dr. Pirie, surgeon and geologist; Mr. Rudmose Brown, botanist; and Mr. Brown and Mr. Wilton, zoologists. They are well supplied with dredging-gear and deep-sea sounding apparatus. After a satisfactory voyage to the Falkland Islands, they left Port Stanley on January 25, intending to reach the pack edge on the 30th western meridian, and follow, if possible, the track of Captain Weddell. This was not found possible by Sir James Ross, but seasons vary exceedingly. I am not aware of Mr. Bruce's grounds for expecting to find a comfortable harbour in that direction, But I have already expressed my views when I discussed the routes for Antarctic Expeditions. Weddell, on February 20, 1823, went as far south as 74° 15′ without meeting with the pack; but Dumont d'Urville was stopped on Weddell's meridian in 64° S., and Ross in 65° 12′ S., finding a dense impenetrable pack. My own impression is that there is a landless ocean of great extent and depth in this direction. But the data on which an opinion can be formed are meagre, and I trust that I may be wrong. It would be a misfortune if Mr. Bruce had to winter in the open pack, where little useful work can be done.

The German Expedition had the great advantage of having selected one of the two best routes for Antarctic discovery. The expedition left Kerguelan Island on January 31, 1902, but appears to have shaped a

course to the south-east. I have always thought that if the *Gauss* made for Kemp and Enderby Land (which are probably one) in about 60° E., a coast-line would be found facing to the east, with navigable water, where great discoveries might be made. Even if Dr. Drygalski, after steering south-east, entered the pack away from the land, I think it likely that there is a coast-line not very far to the east. There are, in my opinion, very great possibilities in that direction, and I hope and believe that my friend Drygalski and his gallant companions will return after having made important discoveries, if not this, then next year. As a necessary precaution, I understand that, if no news is received, a relief ship will be sent out to the German Expedition next autumn. As regards magnetic observations, the *Gauss* is working in concert with the *Discovery*. Meteorological phenomena depend very much on local influences, and the separating distance precludes concert in any other form save in the form of warm and cordial wishes for the welfare of each.

The work of our own expedition, the news of which may be said to be in course of arrival, is so great a subject that it will necessitate separate treatment on another occasion. It will be remembered that the relief ship *Morning* was filled up with provisions, stores, and coals for the *Discovery*, and that a house was specially built on deck, and adapted for taking about a hundred carcases of sheep in ice. Captain Colbeck left Lyttelton on December 6 last, entered the pack on the 26th, and sighted Victoria Land on January 3. He encountered a gale of wind on the south side of the pack which lasted for six days, but he succeeded in reaching Cape Crozier on the 18th. There he picked up a record which served as his guide, and on the 23rd he found the *Discovery* in her winter quarters 500 miles further south than any one had ever wintered before. But 10 miles of fixed ice separated the two ships. Captain Scott writes in well-merited praise of the way in which the *Morning* was navigated. Mistakes might easily have been made, but Captain Colbeck made none. With skill and judgment he negotiated the ice, picked up the right clues, and, getting on the scent, he successfully reached his goal.

The relief ship proved to be a necessity. Owing to the bad tinned provisions, there had been threatenings of scurvy. The remedy was to resort to seal meat, of which there is abundance, as the only animal food to be eaten. The surgeon tells me that with this diet, and the fresh mutton brought by the *Morning*, the scurvy entirely disappeared and is not likely to return. But new and good provisions were urgently needed. Stores, provisions, and coals had to be dragged on sledges, from one ship to the other, over miles of ice. At last the hard work was finished, the *Discovery* was left well supplied for another winter, and on March 3 the *Morning* started on her return voyage. Scott and his officers had come down for a last farewell. It must have been a touching scene. The weather-beaten, frost-scarred heroes, the first

great Antarctic travellers, standing on the edge of that immovable ice which imprisoned their ship, with Mount Erebus for a background. One can almost hear the cheers and see the waving caps as the *Morning* slowly moved away. Think of them now, entering cheerfully upon a second winter! Think of the terrible hardships and sufferings they have gone through for science, and for their country's credit! Is there any tale of derring-doe surpassing the story of those who have planted the cross of St. George in 82° 17′ S.?

But, as I have already said, the news is too great, far too important, to be told in a portion of an anniversary address. It is a very glorious record, and it needs suitable illustration and explanatory maps. All this I will endeavour to furnish at an evening meeting, when the grand results of their expedition must be placed in detail before the Fellows.

The *Morning* must go south again next December. The funds must be provided. But a small sum is needed, about £12,000. I will not contemplate the possibility of its being refused by the Government, for the Government is directly responsible for the safety of the seamen and marines who were invited to volunteer. Our relief ship must go on her pious errand once more, to succour, not improbably to save, our countrymen. That England could fail in such a duty is surely impossible.

THE FIRST YEAR'S WORK OF THE NATIONAL ANTARCTIC EXPEDITION.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S.

We must all, I think, feel that this is a great occasion. We have received news of the splendid work done by our countrymen in the far south, and we are assembled to acquire some idea of the nature of that work, and of the general results. We shall effect this object by means of Mr. Skelton's photographs, and of the best map we have been able to construct with the materials that have reached us. We do not intend to discuss or to describe the scientific results of this work. We have not the means. All *that* is reserved for the grand day when we welcome the return of Captain Scott and his fellow-explorers to this country. To-night should rather be devoted to an endeavour to understand and to appreciate the high qualities, the indomitable energy, the strict sense of duty, the courage and hardihood which enabled our countrymen to make the extensive discoveries which are shown on the map. They represent an achievement which is quite unsurpassed in my time.

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* Read at the Royal Geographical Society, June 10, 1903. Map, p. 120. For note on map see p. 37.

Before following the memorable voyage, I must say a very few words on the subject of the arrangements for the expedition in this country. When the two Societies approached the Government with a view to obtaining assistance in June, 1899, Mr. Balfour spoke in the strongest terms of the importance of such an expedition, both from a scientific and a national point of view, and he was told that it would be necessary to build a ship specially adapted for the service, among other reasons for the sake of the magnetic observations. An estimate was submitted to him amounting to £100,000 if the expedition lasted for three years, or £90,000 if for two years. It was decided that the expedition should be for two years. Mr. Balfour promised a parliamentary grant which amounted to £45,000. The public subscribed the other moiety, this Society giving £8000. The *Discovery* was launched, and has proved most admirably adapted for the work. It has been said that she is the most expensive vessel that was ever built in this country for scientific purposes. It is equally true that she is the cheapest. For she is the only vessel that was ever built in this country for scientific purposes. She has been a great success, and she will be a great success even if she has to be abandoned in the Antarctic ice. The famous voyage performed in her, the vast and important scientific results achieved through her means, will remain for ever as the record of her success, even though the staunch old *Discovery* leaves her ribs in the far south. But this will not be if human help, guided by no ordinary ability and skill, can avail. For if the ship is strong and adapted to her work, still stronger and still better are her crew. No more striking proof of this is needed than the way they have rallied round their beloved commander. Captain Scott's deeds speak for themselves, and he was supported by such officers as Armitage, Royds, Skelton, Shackleton, and Barne; by Koettlitz, Wilson, Bernacchi, Hodgson, and Ferrar; and by twenty-six seamen and marines, all good men and true. Alas that one of the best of all, the devoted and chivalrous Shackleton, is no longer with them! The Admiralty has lent the men, without whom the work could not have been done; but we must always remember that we owe this to the good offices of our lamented associate, Admiral Sir Anthony Hoskins. We owe much more to his memory than even that.

One word with regard to the management of the business of the expedition. Since December, 1900, a Joint Finance Committee, appointed by the Councils of the two Societies, of which I have been chairman, has transacted all the business. The three other members are the treasurers of the two Societies and a distinguished official of the Treasury appointed with the approval of Mr. Balfour; these three business men have conducted the affairs of the expedition on business principles. Efficiency has been secured without waste or extravagance, and most especial care was taken with regard to the examination of the provisions by an expert under official supervision. The committee has worked

and is still working harmoniously, and there has scarcely been a difference of opinion among its members. As a test of its business capacity, we have the fact that the expedition is well within the estimate, and that the committee had a balance of £7000 to meet all further expenditure, if the two ships had returned this year in accordance with the instructions. Captain Scott sat on the committee from its commencement until the departure of the *Discovery*.

Under such auspices the expedition left New Zealand on Christmas Eve, 1901, and entered the Antarctic ice. Her objects were to study the nature of Ross's great ice-barrier; if possible, to discover land to the eastward; to secure various scientific results during the voyage and in winter quarters; and from winter quarters to explore the volcanic region, and to make discoveries to the south and inland to the west. Most thoroughly and completely have the explorers carried out these instructions. Their deeds have far exceeded all that I had hoped, or even conceived possible. Let us now follow their proceedings, and endeavour to get some notion of their surroundings with the help of Mr. Skelton's photographs.

On reaching safe winter quarters, the great work of sledge-travelling was commenced with some autumn journeys. The severity of the weather was intense, both from low temperature, $-42°$ to even $-57°$ below zero, and from the furious gales; but the journeys were of great use, both for obtaining information respecting the lie of the land, and for the acquisition of experience. There was one fatal accident, which is admirably described by Captain Scott.

"Mr. Barne reached the crest of the hills at about noon on March 11, and camped for lunch, during which meal the wind sprang up very suddenly, bringing a heavy drift; the temperature fell, and the party, not experienced in such conditions, suffered much from frost-bites and general discomfort. In these circumstances, and imagining themselves closer to the ship than they actually were, they decided to leave the sledges and make for her. Soon after their start the gale increased, and they were enveloped in a whirl of drifting snow and entirely lost their bearings. Mr. Barne did his best to keep the party together, the more so when it became evident that the slope on which they stood was affording a less and less secure foothold. Before long, however, one of the men, Evans, slipped and disappeared from sight. After shouting and receiving no reply, Mr. Barne, cautioning the men to remain where they were, decided to follow, and very deliberately started to slide down the slope himself. He was firmly under the impression that the slope was one well known to us all close to the ship, and that after making certain he would be easily able to regain the summit and bring the men on. After waiting for some time, another of the men (Quartly) decided to follow Mr. Barne, and was immediately lost to sight. The experience of these three was identical: after the first start they were soon going

at a speed which left them absolutely no control of their movements, and this continued for some 400 or 500 yards, until they were suddenly brought up in a patch of soft snow within 15 feet of a sheer drop into the sea.

"Meanwhile, of the party above, one, Hare, had decided to go back to the sledge to change his footgear, and the remaining five, after a long wait, proceeded along the slope, as they supposed, towards the ship, led by an able seaman (Wild). Luckily, Wild had nails in his boots, for, after travelling some distance, he suddenly and without warning (so thick was the snow) found himself within an ace of stepping over the cliff into the sea. He had the presence of mind to shout to the others to stop, which they were all able to do, except poor Vince, who missed his footing, shot past Wild, and was immediately lost to view. Vince was a thoroughly good man, always cheerful and bright, and popular throughout the ship. With great difficulty the remaining four men succeeded in retracing their steps, and eventually reached the crest of the hill, from whence, taking a more easterly course, they fell on some landmarks and found their way to the ship. Great credit is due to Wild for the manner in which he conducted and kept together the small party. A large search party was immediately despatched on their return to the ship, and the siren was kept going. With some difficulty the search party succeeded in finding the sledges, and in the vicinity they found Mr. Barne, Evans, and Quartly half frozen and wholly dazed; they did not know how they had again reached the summit of the hill. No trace was found of Hare or Vince. A further prolonged search was made on the following day, a roped party descending the slope with crampons, but without result. On the third day I got up steam on the bare possibility of finding an ice-foot below the ice-cliff over which Vince had fallen, and whilst we were preparing to weigh, Hare was seen descending the hill opposite the ship; he was quickly brought on board, and found to be neither frost-bitten nor in any way hurt by his exposure; he had turned to find the sledges, failed to do so, wandered aimlessly about, and finally lost consciousness; thirty-six hours later he awoke, to find himself buried in snow and only a trifle stiff; he imagined it to be the morning after the accident, and was astounded to learn that he had slept through a whole day.

"On taking the ship around to the scene of the accident, we found on ice-foot, and it was evident that Vince must have fallen directly into the sea from a cliff 150 to 200 feet in height."

When Captain Scott addressed the ship's company in a few words after service on the following Sunday, there was scarcely a dry eye. All mourned the loss of their comrade, George Vince, a cheerful and popular messmate, and an excellent seaman.

The winter passed cheerfully. There were plenty of amusements; but there was also plenty of hard work. Mr. Bernacchi tended his

magnetic instruments with zealous care, and took regular observations with the electrometer. The temperature and salinity of sea-water at various depths were ascertained. Mr. Hodgson was indefatigable in all weathers, keeping holes open in the ice for his nets and fish-traps. Dr. Wilson's work, as regards vertebrates, is exceedingly valuable; and I am assured that the biological collections are most important, and will form one of the great features of the expedition. The meteorology is under the charge of Lieut. Boyds, and nothing can exceed his care and diligence. A series of meteorological observations for two years, in 77° 50′ S., more than 500 miles further south than any ship has ever wintered before, will be most valuable.

As the sun began to return, the magnificent range of mountains to the westward began to appear in surpassing grandeur. The glow of the sun when it was still below the horizon just caught them, and the sides facing the north were lit up with a pinkish-orange tint, the other sides being dark and shadowy. In September the early spring travelling commenced, when the cold was even more intense than in the autumn. Royds and Skelton were the chief explorers of the volcanic island on which Erebus and Terror rear their giant cones. With four men, they were away twenty-one days, with the thermometer always −40°, and once as low as −58°. This cold is too intense for sledging, and in addition they encountered a furious gale, which lasted for five days. In spite of the weather, Skelton and two men found a way over the big ice-ridges of the barrier down to the sea-edge, using crampons and ice-axes, and being roped together. A close examination was thus made of the position where the barrier abuts upon the land at Cape Crozier. In a subsequent journey Royds found the post cairn at this point, and deposited a notice for the relief ship.

There were several sledging journeys for short distances conducted by the scientific staff, chiefly with the object of geological investigations; but the great results were to be obtained from the southern and western parties.

Captain Scott established a depôt 60 miles to the south in a journey of ten days, from September 23 to October 4, when there was a heavy gale, and the thermometer fell to −51°. On November 1 he started with eighteen dogs, accompanied by Lieut. Shackleton and Dr. Wilson. A supporting sledge under Lieut. Barne went as far as the first depôt. At first all went well, but after a fortnight the dogs got weaker and weaker, and a long tract of soft snow had to be crossed, which occupied them for thirty days, bringing the sledges up in relays. Practically the dogs became useless. The explorers had to do all the work themselves. But, nothing daunted, the gallant men pushed onwards, lightening the weight by leaving a depôt in 80° 30′ S.

They reached 32° 17′ S. On their return Lieut. Shackleton broke a blood-vessel, and was only just able, owing to his extraordinary

pluck, to keep up with the sledge; while Scott and Wilson, suffering from snow-blindness and hunger, dragged the sledge back, 240 lbs. each, and reached the ship on February 4, after an absence of ninety-four days.

I calculate that they must have gone over 981 statute miles. The story will be told by Scott himself—a story of heroic perseverance to obtain great results; a story which is unmatched in polar annals. It will tell us, too, of new geographical facts and deductions of intense interest; of a new and hitherto unknown world in the far south, reached with such extreme difficulty—

> "Yet even here Britannia's flag has thrown
> Her shadow on the ice, and hailed the land her own."

The achievement of the great western party, dragging sledges over mountains and glaciers, with such leaders as Armitage and Shackleton, is only second to Scott's memorable journey. They were dragging 240 lbs. per man; first over 29 miles of sea-ice, and then for 19 miles up a snow-filled valley to the foot of the mountains. They also had to work by relays. Crampons, blocks and tackles, ice-axes, and crow-bars were needed; and so they climbed the ice-slopes with loaded sledges, and travelled many miles over bare blue glacier amidst magnificent scenery, reaching an elevation of 9000 feet, at a distance of 142 statute miles inland from the ship as the crow flies. They were fifty-three days away.

The loss of the dogs was felt as a great calamity, because each dog was given in charge to a man, who became much attached to it. There are, however, several puppies.

Another calamity was the loss of all the boats, which during the winter got frozen into a mass of solid ice. After hacking at this ice for months, it was found impossible to extricate the boats.

But now all the travelling parties had returned, and the longed-for relief ship *Morning* hove in sight on the 23rd of last January.

The meeting is acquainted with the history of the relief ship; how she was bought, fitted out, equipped, and despatched last year by the Geographical Society, with funds subscribed almost entirely by our Fellows. We all know the great dangers of polar navigation, and that a ship in those regions may be in need of succour after the first winter. Consequently, annual communication has been the rule with all Government expeditions since the Franklin disaster. We were bound to follow this example; and the necessity for our action has since been proved.

The *Morning*, fitted up with provisions, including a good supply of frozen meat, and coals for the *Discovery*, left Lyttelton, N.Z., on December 6, and crossed the antarctic circle on Christmas Day. She is commanded by Captain Colbeck, a very able and capable ice-navigator, who has under him zealous officers and a good crew. In about 67° 40′ S.,

an interesting discovery was made of a new island, of which several excellent photographs were taken. A landing was effected, and a survey was made; it was named Scott island.

Outside the pack the *Morning* encountered a heavy south-east gale, bergs and heavy floe pieces being a source of continual danger, and the ship was subjected to a most severe straining. At one time she could show no canvas. The season was very late, and the navigation difficult. But Captain Colbeck followed up his clue, found the record at Cape Crozier, and finally sighted the *Discovery's* masts.

It was found that several miles of ice intervened between the two ships, and it was not long before it became clear that the ice was not likely to move during that season. All hands at once went to work to transfer stores and provisions on sledges, and before it became necessary to depart, the *Morning* had supplied fourteen tons, and twenty tons of coal. But there was barely time.

The arrival of the *Morning* was most providential, but she leaves the *Discovery* with only provisions to last until next January, and eighty tons of coal.

In returning, the *Morning* was in some danger of being detained. She was beset, but was saved by her skilful ice-navigation, aided by a strong south-westerly gale. Her detention would have been a terrible calamity. She, however, returned safely to Lyttelton, N.Z., last March.

Captain Colbeck deserves high commendation for the skill and ability with which he conducted a very arduous and difficult voyage; for his excellent judgment in finding the winter quarters of the *Discovery*, his rapid transfer of stores, and the seamanlike qualities which enabled him to work his vessel safely out of the ice under circumstances of no ordinary difficulty. The officers worked under him with zeal and intelligence, and the conduct of the men was excellent throughout the voyage.

It will be seen that a second voyage of the *Morning* is absolutely necessary for the safety of our gallant countrymen. There are thirty-seven souls in the Antarctic ice, consisting of five naval officers, one officer of the naval reserve, five members of the scientific staff, twenty-four naval seamen and marines, and two other good men. We have a balance of £7000. Only a small additional sum is needed, namely, £12,000. Without it those heroes who have done so much for science and their country's credit will be in grave peril.

We must provide for wages for both ships; we must send out the means of blasting and forcing the *Discovery* out of her icy prison; we must repair the *Morning*, so terribly strained and knocked about; we must store her with coals and provisions.

There are difficulties and dangers yet, but the chief dangers are financial. Our gallant Colbeck and his people will overcome the rest.

Meanwhile, the heroic Discoveries are still working for us at their numerous observations under increasing hardships caused by the small stock of coal. They have full faith in us, and that the needful funds will be found by us. Look once more at your maps. Look at their discoveries. Do not these men deserve well of their country? Will not their country recognize their services? I feel sure that it will, and that we shall yet welcome them all here, after one of the most successful and glorious achievements that have ever adorned our geographical annals.

NATIONAL ANTARCTIC EXPEDITION: REPORT OF THE COMMANDER.*

UNDER the title of "Brief Summary of Proceedings," Captain Scott sends the following report addressed to the Presidents of the Royal and Royal Geographical Societies. It is dated "*Discovery*, Winter Quarters, February 23, 1903."

As is known, the *Discovery* left Port Chalmers, New Zealand, on Christmas Eve, 1901, heavily laden.

With a fair wind, we made good progress under sail alone until our arrival in the pack.

On the evening of January 1 we passed several table-topped bergs, and on the following day, in lat. 66° 30′, fell in with streams of loose field-ice.

The antarctic circle was crossed early on the 4th, the pack remaining easy and the weather favourable, except for occasional thick fogs.

On the 6th the pack became much heavier and our progress consequently slower; later all traces of a swell disappeared, and we forced our way through rotten floes of very large area.

We passed through several leads of open water on the 7th, and on the morning of the 8th crossed the southern edge of the pack in lat. 70° 25′, long. 173° 44′, the edge being well defined, with a clear open sea beyond, and soundings in 1480 fathoms.

Opportunities were taken before and after this to sound, dredge, and take water samples, but owing to closeness to the coast and the thick pack which was usually about us, much less of this work was possible than I could have wished.

We arrived at Cape Adare on the evening of the 9th, having to force our way through a line of thick pack in entering Robertson bay; after taking magnetic observations, watering ship, and leaving a record, we weighed anchor again at 3 a.m. on the 10th, passing out close under the land, where we became involved in a very heavy pack running fast to the northward past several grounded bergs. After several hours of struggling, I was glad to get through this into clearer water.

We turned down the coast, passing outside the Possession islands,

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* Map, p. 120.

but had now to face an increasing south-easterly wind and continual streams of pack passing to the northward.

We arrived off Coulman island on the night of the 12th, but as the wind had increased to half a gale and the glass was falling, I decided to make for shelter under the island; we arrived there on the evening of the 13th, and on the following morning the wind had increased to a full gale. Except as regards the sea and pack, the island afforded little shelter; the wind swept down from the heights with terrific force, and the ship was repeatedly driven to leeward, narrowly escaping collision with several small bergs.

On the 15th the wind fell rapidly, and in the afternoon I was able to place a record at Cape Wadworth, in the spot arranged.

In the evening, in bright calm weather, we were able to stand into an inlet in the ice-barrier in Lady Newnes bay, and all hands were employed in killing and skinning seals for winter consumption; we left this inlet at 8 a.m. on the following day, but had to pass again to the northward of Coulman island to avoid the pack.

We had now to make a very long circuit to clear heavy pack, and arrived off Wood bay on the night of the 17th.

The bay ice was cracked, but had not moved out; it was very thick and heavy, and consequently I abandoned the idea of leaving a record at this spot.

At noon on the 18th we passed close to Cape Washington in clear water, obtaining as shallow a sounding as 8 fathoms. From this cape the absence of pack allowed us to trace the coast-line at a very easy distance, and to observe and sketch the mountains in the background. In about lat. 75° 30′ an enormous floe of the inland ice descends into the sea and extends for many miles to seaward. The ice-mass, which must be afloat at its outer edge, closely resembles the Great Barrier and the barrier formation which entirely fills Lady Newnes bay.

On the night of the 18th we entered a curious inlet at its northern junction with the land. From this point we were obliged to pass direct to the eastward, skirting ice-cliffs rising to 150 feet in height.

At noon on the 19th we rounded the end of this ice-mass, but were unable to again approach the land immediately, though at 6 p.m. we again turned in that direction.

A bluff headland now observed to the south-west gave indication of a harbour, and our course was shaped for it, but this necessitated passing through streams of very heavy hard ice, and our progress was therefore slow, and it was not until 6 p.m. on the 20th that we entered a long inlet which gave promise of forming an excellent winter harbour.

A landing was effected, and some hours spent in exploring the inlet and securing specimens of rock, moss, etc. Leaving the harbour shortly after midnight, we continued for some distance in clear water, but later encountered streams of loose ice, and by the forenoon were in thick pack

with an uninterrupted stretch of ice before us. We made such poor progress that at 8 p.m. (21st) I decided to turn to the eastward, more especially as I then fully thought I could trace continuous land between Mount Erebus and the mainland.

The weather since our departure from Coulman island had remained wonderfully clear and bright.

Passing south of Beaufort island, we arrived off Cape Crozier on the evening of the 22nd, and landed at the foot of Mount Terror, visiting the penguin rookery, placing our record and taking magnetic observations. Climbing a foothill to the height of 1350 feet, we here got our first view of the barrier. The shore party were re-embarked at 4.30, and we stood close around Cape Crozier.

Until the 28th we continued to push close along the barrier edge in face of a steady south-easterly breeze and westerly set.

On the 26th the wind increased to half a gale, and we stood off under sail; but the wind again fell in the morning, and we were able to close the ice. During this time soundings were taken three times daily, and the height and irregularities of the barrier edge observed as closely as possible.

It is impossible to give details of this work until we have had time to plot it; but in general it may be remarked that the soundings remained fairly uniform at something over 300 fathoms until the night of the 29th, when 100 fathoms was obtained; and the barrier edge is most irregular, varying from 30 feet to 215 feet, though long stretches of it appear to be of uniform height. On the 29th the barrier was observed to be very irregular in outline, and in the evening we ran into a sharp bend amongst many stranded and overturned bergs. Here we first obtained shallow soundings (100 fathoms), and observed that the barrier rose to the eastward in gradual snow-slopes to a height of 800 or 900 feet, continuing to form a number of undulating hills, trending to the northward. From this time the fine clear weather we had had so far enjoyed deserted us, and a northerly breeze brought continual snowstorms, which prevented our seeing clearly for any considerable distance. On the morning of the 30th we were skirting the edge of low fast ice embayed between ice islands; much pack lay in the offing. The soundings varied greatly, but several were between 70 and 100 fathoms. At four, a lift in the fog showed us high rising snow-slopes in the background, descending gradually towards the sea until they fell away into heavy ridges and precipices 300 or 400 feet in height, from the base of which a gentle slope led to a barrier wall, capable of sending forth table-topped bergs. Though morally certain we were in the vicinity of land, the appearance of ice-formation is so deceptive in thick weather that I was glad when several dark patches loomed out of the mist and were quickly distinguished as patches of bare rock. These patches stand at a height of 2000 to 3000 feet, and are evidently the sharp spurs of hills which are otherwise completely snow-capped.

During the morning of the 31st we skirted along the edge of solid fast ice, and later were amongst several ice-islands; these are mostly dome-shaped on top, descending to ice-cliffs 50 to 60 feet in height; the soundings close to being about 100 fathoms, it is impossible to know whether these are ice-capped islands, ancient grounded bergs, or the remains of a receding barrier formation. They undoubtedly prevent the fast ice from breaking away to the coast-line.

Very large colonies of Emperor penguins were seen in this vicinity.

During the night of the 31st we became embayed amongst ice-islands and grounded bergs, almost completely connected by fast ice; in the bay the temperature fell, and young ice formed with extraordinary rapidity. After looking fruitlessly for an outlet, we were forced to come out through the narrow passage at which we had entered. I then made a *détour* to the westward in hopes of finding an open lead, but as we increased our distance from the land we were faced in all directions by heavy pack.

At this point, seeing the inadvisability of wintering in these regions, and not knowing how late a date it would be possible to find winter quarters in Victoria Land, I determined to turn back, though it is now evident we could have pursued our exploration to a later date.

On February 3 we entered an inlet in the barrier in lat. 78° 30′, long. 196° 15′. It was wholly sheltered, and we were able to lay alongside an ice-foot on to which we could step from the ship's rail. The barrier here undulated in long waves running approximately west-south-west and east-north-east; the ship lay in an inlet formed in the hollow of one of these undulations, and a long crack continued the inlet to the westward. Numerous seals lay about on the ice in the vicinity of this crack. This night I despatched Lieut. Armitage with a small sledge party to explore the ridges, and prepared to inflate our balloon. On the 4th the balloon was inflated, and I was able to ascend to a height of 700 feet, the wire attachment being unfortunately too heavy to allow of a higher ascent. The day was clear; the alternate light and shade of many parallel lines of undulation could be seen to the southward, and nothing beyond. Shortly after noon Lieut. Armitage returned, having travelled about 9 miles to the south and traversed several of these undulations. After securing the carcases of eighteen seals killed in the morning, we put to sea again at 7.30. A sounding taken in the inlet showed 315 fathoms, and it was noticeable that the ship neither rose nor fell in relation to the ice throughout our stay.

We returned along the barrier and rounded Cape Bird on the evening of the 7th in heavy and continuous snowstorms. I now made for some steep headlands in about lat. 77° 30′, which we had observed on our way south, and hoped to find the limits of a harbour similar to that which we had entered to the northward.

The day was fine (8th), but when within 10 miles of the land we

were brought up by a heavy pack, and decided to skirt this, making as much southing as possible. In the afternoon we passed close to an extraordinary *débris*-strewn and water-worn glacier snout, on which we landed. Proceeding as before, we now found ourselves going about due east and towards the southern side of Mounts Erebus and Terror. Finally, in the evening we arrived at Hut point, securing the ship to the ice-foot.

I give elsewhere a description of our winter quarters, with the present position of the ship, and a rough plan of the neighbourhood.

Everything pointed to the desirability of this spot as winter quarters. The one year's ice was moving out rapidly, and showed absolutely no signs of pressure. Hut point would provide an additional safeguard against such a possibility; suitable places were easily found for the huts, to communicate with the agreed position, for our record position at Mount Terror seemed (and proved) easy; the road to the southward appeared open, and the distance from the mainland was small enough to ensure an attempt at its exploration.

No thought that the ice might not again move out this season entered any one's head, and, of course, was the less likely to do so as the open sea extended farther and farther beyond Cape Armitage. Personally, my fear was that some sledge party might be cut off by the ice moving out too quickly, and without warning, as it did last year.

On February 11 we commenced erecting the huts, but the task was much interrupted by strong south-easterly winds; whilst the amount of work on ship and shore prevented all ideas of despatching early sledge parties.

On the 18th, three of the officers—Messrs. Shackleton, Wilson, and Farrar—crossed to the island, which lies about 15 miles south-south-east of the ship; they returned on the 22nd, with considerable information as to the lie of the land.

On the 24th we were able to land coal, oil, and provisions, and thus established a depôt in the event of the ship being driven off. The magnetic huts were erected, and the instruments in adjustment, in time for the term day observations of March 1.

The work was now so far advanced that I proposed to take a sledge party round to Mount Terror, but, unfortunately, strained my leg whilst exercising on ski, and was forced myself to abandon the project.

On Monday, March 3, the party started under the direction of Mr. Royds, and included Mr. Barne, Dr. Koettlitz, Mr. Skelton, and eight men. As they entered the eastern bay, the snow grew daily softer, and the work finally so fatiguing, that Mr. Royds decided to push on with Dr. Koettlitz and Mr. Skelton on ski, sending the remainder of the party back under Mr. Barne, they having no ski.

By this time the ice had broken away well past Cape Armitage, and it was necessary for the returning parties to cross the hills, rising to an altitude of 1000 feet, to reach the ship.

Mr. Barne reached the crest of the hills at about noon on March 11, and camped for lunch, during which meal the wind sprang up very suddenly, bringing a heavy drift; the temperature fell, and the party, not experienced in such conditions, suffered much from frost-bites and general discomfort. In these circumstances, and imagining themselves closer to the ship than they actually were, they decided to leave the sledges and make for her. Soon after their start the gale increased, and they were enveloped in a whirl of drifting snow and entirely lost their bearings. Mr. Barne did his best to keep the party together, the more so when it became evident that the slope on which they stood was affording a less and less secure foothold. Before long, however, one of the men, Evans, slipped and disappeared from sight. After shouting and receiving no reply, Mr. Barne, cautioning the men to remain where they were, decided to follow, and very deliberately started to slide down the slope himself. He was firmly under the impression that the slope was one well known to us all close to the ship, and that after making certain he would be easily able to regain the summit and bring the men on. After waiting for some time, another of the men (Quartly) decided to follow Mr. Barne, and was immediately lost to sight. The experience of these three was identical: after the first start they were soon going at a speed which left them absolutely no control of their movements, and this continued for some 400 or 500 yards, until they were suddenly brought up in a patch of soft snow within 15 feet of a sheer drop into the sea.

Meanwhile, of the party above, one, Hare, had decided to go back to the sledges to change his footgear, and the remaining five, after a long wait, proceeded along the slope, as they supposed, towards the ship, led by an able seaman (Wild). Luckily, Wild had nails in his boots, for, after travelling some distance, he suddenly and without warning (so thick was the snow) found himself within an ace of stepping over the cliff into the sea. He had the presence of mind to shout to the others to stop, which they were all able to do, except poor Vince, who missed his footing, shot past Wild, and was immediately lost to view. Vince was a thoroughly good man, always cheerful and bright, and popular throughout the ship. With great difficulty the remaining four men succeeded in retracing their steps, and eventually reached the crest of the hill, from whence, taking a more easterly course, they fell on some landmarks and found their way to the ship. Great credit is due to Wild for the manner in which he conducted and kept together the small party. A large search party was immediately despatched on their return to the ship, and the siren was kept going. With some difficulty the search party succeeded in finding the sledges, and in the vicinity they found Mr. Barne, Evans, and Quartly half frozen and wholly dazed; they did not know how they had again reached the summit of the hill. No trace was found of Hare or Vince. A further prolonged search was

made on the following day, a roped party descending the slope with crampons, but without result. On the third day I got up steam on the bare possibility of finding an ice-foot below the ice-cliff over which Vince had fallen, and whilst we were preparing to weigh, Hare was seen descending the hill opposite the ship; he was quickly brought on board, and found to be neither frost-bitten nor in any way hurt by his exposure; he had turned to find the sledges, failed to do so, wandered aimlessly about, and finally lost consciousness; thirty-six hours later he awoke, to find himself buried in snow and only a trifle stiff; he imagined it to be the morning after the accident, and was astounded to learn that he had slept through a whole day.

On taking the ship around to the scene of the accident, we found no ice-foot, and it was evident that Vince must have fallen directly into the sea from a cliff 150 to 200 feet in height.

Though Mr. Barne made an error in breaking camp in a snowstorm, it must be remembered in extenuation that he, in common with all, was inexperienced in the climatic conditions of these regions; that he imagined himself much closer to the ship than he was; and that his party, expecting higher temperatures, were very ill provided with fur clothing, and would have been most uncomfortable in their tents. The event proved a lesson to all, and Mr. Barne has in his more recent expedition taken exceptional and most praiseworthy care of his men.

On March 20 Mr. Royds and the remaining officers returned to the ship; they had failed to reach the spot for depositing the record, but chiefly because they had encountered very severe weather in the vicinity, and their provisions were too short to allow of delay. They were evidently very close to the spot, and no doubt remained that we should be able to reach it in the spring.

During the month of March ice repeatedly formed about the ship, but was constantly blown out; that which formed immediately around her on March 24 has remained, though for some time, I think, only because the ship held it in.

On April 1 Mr. Armitage and I started with a party of twelve men and the dogs to lay out a depôt to the south-east. After crossing the new ice and rising to the barrier surface, the temperatures fell rapidly until the average was below $-40°$; the dogs' coats were in very poor condition, and we could get no work out of them; the fur clothing proved to be unsuitable, and the men, wholly unaccustomed to the conditions, suffered severely. After three days, therefore, the temperature having fallen to $-48°$, I decided to turn back, and returned to the ship.

From this time preparations for the winter were pushed on, the winter awning was spread, and the ship made as snug as possible.

The winter passed very comfortably. The men remained cheerful throughout, plenty of work was found for them out-of-doors, and a regular routine was maintained; the only drawback was the prevalence

of a keen but apparently purely local south-east wind, which often made our exercise unpleasant and not infrequently impossible. It was not until May 3 that a strong southerly gale brought the first heavy snowfall, allowing the decks and sides of the ship to be partially covered with snow; this greatly improved our comfort below. The same gale blew the strait clear of ice to within 200 yards of the ship.

I fear I have not the time to relate all the incidents of the winter, but I would mention that officers and men did their best to continue all the scientific observations possible under the conditions. Mr. Hodgson was always out and about, keeping holes open in the ice for his nets and fish-traps, and, whatever the temperature, volunteers were always ready to assist him at the work.

All the officers joined in taking the night meteorological observations, though Mr. Royds alone took those between 10 a.m. and 10 p.m.

Mr. Bernacchi tended his magnetic instruments with zealous care, and took regular observations with the electrometer. Ice-measurements were taken as often as possible, and tidal observations regularly. Experiments were carried out to determine the temperature and salinity of the ice at various depths. Auroral displays were infrequent and feeble, but were carefully observed when they occurred.

We experienced our lowest temperatures in the spring, when also the wind became even more persistent and annoying. Every indication pointed to the temperatures to the south and on the Barrier being far lower than those which obtained about the sheltered position of the ship.

On September 2, I started with five officers and fifteen dogs to the northward to explore the bay towards Cape Bird and examine the islets and glacier in it. This short journey convinced me that it was possible to start the prearranged reconnaissance trips. I returned on the 5th, and on the 10th Mr. Royds, with Dr. Koettlitz and five men, proceeded to the south-west with a fortnight's provisions in an attempt to reach the mainland.

On the 11th, Mr. Armitage, with Mr. Ferrar and five men, started to the westward with the same intention. Approximately south-south-east of us lies a white snow-covered island, and south-south-west a black wind-swept one; a bold headland connected with the mainland can be seen beyond through the gap almost due south of the ship. My own intention was to lay out a depôt in this direction.

Mr. Royds returned to the ship on the 19th, having experienced very low temperatures and much wind; from his report I learned that no clear water to the mainland was likely to be found in a south-western direction.

I started with my party on the 17th, but at the first camp, about 12 miles from the ship, encountered a heavy gale, which blew throughout the 18th with a temperature below -40° (min. -51°); as our sleeping-bags were filled with ice, and one of the party badly frost-

bitten, I returned on the 19th, and again started on the 23rd with Mr. Shackleton, the boatswain, and the dogs.

We reached the north side of the cape in three days, but found our further progress barred by heavy ice-upheavals, cracks, and crevasses, evidently the result of the barrier ice pressing up from the southward around the cape. Turning to the eastward, we had, in a bad light, to cross very disturbed ice with deep, lightly bridged crevasses; into one of these the boatswain fell, and was only saved by his harness, which luckily held, though stranded. We arrived on the southern side of the cape on the 30th, and, selecting suitable leading marks, deposited the depôt about 8 miles from the land and 60 miles south of the ship.

From this point land could be seen to the south-south-west, continuing the outline of Victoria Land, but from this direction through south to the slopes of Mount Terror, bearing slightly to the eastward of north, an unbroken horizontal line indicated the continuance of the barrier surface. Returning outside the snow-covered island, and therefore skirting the disturbed ice, we regained the ship in 2½ days. On my return I learned that Mr. Armitage, after an arduous journey, had arrived back on the 25th with his party in a more or less broken-down condition.

The cause was undoubtedly scurvy, and, as undoubtedly, the disease was brought out by the severe work and exposure to which they had been subjected.

The most severe cases were Mr. Ferrar, Cross, P.O., and Heald, A.B.

A thorough examination of the ship's company showed that there was a taint of the disease in both officers and men.

The following steps were taken: all tinned meats were discontinued, and only seal meat served out.

An extra allowance of bottled fruit was issued, and lime-juice provided.

The holds and storerooms were again thoroughly overhauled and disinfected.

Under these conditions, to which must be added the gradual improvement in the weather, and the inspiriting effect of the lengthening days, all symptoms quickly disappeared. Mr. Ferrar, Cross, and Heald rapidly recovered.

I realize that this outbreak of scurvy, such as it has been, is more than likely to be exaggerated by irresponsible persons, especially in view of the tales that may be told by or attributed to the men now being discharged from the ship. Whilst appreciating the gravity of the disease in this climate, I beg to assure you that the outbreak was in reality slight, as indicated by the rapidity with which it was thrown off. I doubt if its existence would have been discovered but for the severe work which brought it to light in Mr. Armitage's party.

In consultation with the doctors, I can arrive at no satisfactory explanation of the cause of the outbreak. The tinned meats used in

the winter are of excellent quality, and every tin was examined by the doctor before use. For the greater part of the winter seal meat was issued three times, and fresh mutton once a week.

A possible cause may lie in the following facts:—

(1) For a month before the commencement of sledging the supply of seal meat ran short; very few seals came up on the ice, and the full ration could not be issued.

(2) The cook, though quite capable of cooking well, served up the dinners, and especially the seal meat, in a most unappetizing manner.

I fear it is not in my ability to throw more light on what has happened, but I beg to call your attention to the certainty of recovery which results from a liberal supply of seal meat.

This was the more evident in connection with the extended summer sledge journeys: the disease again manifested itself in a slight degree, but was immediately dispelled on the return of the men to the ship.

There is absolutely no cause for anxiety should we be forced to spend another winter here. The men remaining are now in the most splendid health and condition, and we shall have no difficulty in laying in an ample supply of seal meat. We have already shot a large number of Shua gulls, which we find excellent eating.

Mr. Armitage, in his reconnaissance, succeeded in reaching the surface of a glacier on the mainland, and continued to ascend it to a height of several hundred feet; he reported a good prospect of being able to continue on it to the inland ice.

On October 4 Mr. Royds, Mr. Skelton, and four men left the ship for Mount Terror, to renew the record previously left at the Penguin Rookery.

The eastern slopes of Mount Terror are terribly wind-swept, and their surface is bare to the summit. On arrival at their foot the party encountered a heavy gale, which blew continuously for five days, for the greater part of which they were confined to their tents, round which the snow steadily accumulated, narrowing their space. Cooking was rarely possible.

Mr. Royds suffered severely from cramp, and in consequence when this gale ceased Mr. Skelton started with two men to find the record. This was successfully accomplished, and on the following day the same small party, roped together, wearing crampons and carrying ice-axes, succeeded in descending to the sea ice, where Mr. Skelton had previously observed a large number of Emperor penguins. As a result of his enterprise he was able to get several specimens of young Emperor penguins in down, and an excellent series of photographs and notes.

Mr. Skelton deserves great credit for this discovery, the descent on to the sea ice being a very hazardous proceeding over the very disturbed ice at the place at which he made it.

Mr. Royds returned to the ship on the 24th. During the first part of the journey he had experienced very low temperatures, one of which, −57°, is the lowest recorded on any of our journeys.

By this time preparations for the southern trip were almost completed.

On October 30 Mr. Barne started with eleven men as a supporting party, with instructions to make for the depôt (A) which I had already established off the Southern cape.

On November 2 I left the ship myself with Dr. Wilson and Mr. Shackleton and nineteen dogs. The dogs were in splendid condition, and, though loaded with 100 lbs. apiece, were so fresh that we were obliged to sit on the sledges to restrain them. We caught up Mr. Barne that night as he was starting on a night march, having been detained by bad weather. The weather continued very unsettled, and we did not reach the depôt till the 10th, and the supporting party joined us there on the following day, and we started due south in company on the 12th. The dogs were in such excellent condition that they far out-distanced the men, and we gradually increased their loads until on the third day they were dragging the whole of our own loads, and the supporting party, which I had intended carrying some way further, were no longer of use. On November 15, therefore, in lat. 79° 15′, I directed them to return to the ship, and we continued our journey alone.

At this time we had high hopes of being able to explore to a considerable distance over the barrier, but within a very short time the aspect was completely changed. Almost at once the dogs began to show signs of weakening, and at first it was very difficult to discover the cause; rest and increase of food made no improvement. We eventually discovered that it was the nature and not the amount of food that was at fault. Norwegian stock fish was the food selected and strongly recommended from its use in Greenland, where a team of twenty-three dogs had been worked on it for three years without the loss of a single animal. This being so, one can only conjecture that the fish deteriorated on its passage through the tropics: certainly its effect on our dogs was most disastrous. We continued to the southward, but were forced to do so by advancing half our load at a time; the surface became more difficult, and dogs failed so speedily that we were obliged to pull ourselves to get even the half-load along.

As we proceeded, we could distinguish new but distant land on our right, continuing that which we had observed from depôt (A) to the west-south-west, and it soon became evident that this land extended to the south approximately parallel to our course.

We crossed the 80th parallel on November 27, when our progress became so laborious that we could hope to do little without establishing a further depôt, and the course was altered to south-west and later to west-south-west.

It was not until December 15 (after twenty-nine days of relay work) that we arrived sufficiently close to the land to obtain good leading marks for our depôt. As we could not rely on the dogs for our return, I left here (depôt B) three weeks' provisions, and proceeded to the south with the four weeks' which we had remaining. We lightened our load in every way possible, carrying no dog food, and calculating our own food for something less than 2 lbs. per day per man.

Depôt B was approximately in lat. 80° 30′, long. 162° E., about 7 miles from a snow-covered headland, which formed the northern extreme of a mass of land with high and irregular ranges of mountains in the background. To the north of this headland, between it and another mass of high land, the barrier ran back through an apparent strait, behind which nothing could be seen, though it is evident, from the disturbed state of the surface, that ice is pressing out through the strait.

Another such strait exists at the farthest point we reached, and another to the northward.

We continued south along the coast-line until December 30, the surface often soft and sticky, and close to the land invariably so, the dogs growing daily more feeble and sickly.

We had now arrived in lat. 82° 17′, long. 163° E., and were close to a cape which bounded the northern side of another apparent strait running in a north-west direction. To the west-south-west there was a range of magnificent mountains, and another range of great altitude lay to the south, close to the coast-line, which continued as far as could be seen in a direction south by east of our position.

I fear it is impossible without a chart, and in the time at my disposal, to inform you of the many points of interest of this journey.

I took as careful observations as I could for our positions, and of the bearings of the various land masses, the altitudes of the mountains, etc., but it will take a considerable time to work out and plot these observations. Dr. Wilson has a most excellent series of sketches of the coast from many points of view, and Mr. Shackleton has some photographs of interest.

On December 31, we made an attempt to reach the land to secure rock specimens, though undoubtedly the rock is of the same volcanic nature as that to the northward. After proceeding about 4 miles on ski, we were confronted by an immense chasm, a mile in width, and about another mile from the cliffs. The chasm was filled with huge irregular blocks of ice. With the aid of a rope and with much exertion we commenced to climb across and around these blocks. As we proceeded they became sharper and "newer" in outline, and much less snow lay about them. When within a few hundred yards of the other side, we found that the inner boundary of the chasm consisted of a huge perpendicular ice-foot trench, resembling that we had seen both east and west bounding the lands and washed by the sea. A gentle snow-slope

descended from the foot of the cliffs to the ice-foot, and the blocks of ice that lay in the chasm had evidently calved from it. As it was obviously impossible to climb this ice-wall, we were forced to return to camp.

On January 1 we started back for depôt B. The dogs were now utterly spent and practically useless from this point; on the 9th, we unharnessed them, and, hoping to keep some alive, carried their food on our sledges. The weather now became very thick, and the land was obscured; the surface seemed to grow more difficult, and we had most serious trouble in steering a course, our fickle guides being the sun, wind, and astrugi, or the tail end of a cloud: during these days, most of these, and sometimes all, failed us. On the 13th, we were forced to camp for this reason; we had only two days' provisions left, but though we had been travelling for some time almost by dead reckoning, I knew we must be in the vicinity of the depôt. I was therefore much relieved when at noon a slight clearance of the mist showed us the depôt flag about 2 miles to the northward,

On returning to this depôt, I hoped to be able to make another attempt to reach the land, and to carefully pilot the coast-line to the northward; the former was rendered impossible, and the latter difficult, by the sudden breakdown of one of my companions, Mr. Shackleton. Before reaching depôt B, it seemed to me he was feeling the strain of our recent work much more than Dr. Wilson or I were; he suffered considerably from shortness of breath.

When we left depôt B on January 14, the congestion had greatly increased: he was breathing asthmatically and spitting up a considerable amount of blood. Recognizing the gravity of the case, Dr. Wilson and I decided we must push on at all costs, and keep Mr. Shackleton walking on ski beside the sledges. This necessitated Dr. Wilson and I dragging 260 lbs. apiece, and I do not think we could have carried Mr. Shackleton as well. By this time our dog team had dwindled to two—the other poor animals, growing too weak to even walk alongside the sledges, had been dispatched; for the two (our best) we were carrying food, hoping to save them, but at this crisis I abandoned this idea, and they were killed. Relieved of all camp work and pulling, Mr. Shackleton made some progress towards recovery, and was able to keep up well until we reached depôt A on January 28, when he was again thrown back by a snowstorm, and caused us the gravest anxiety. On the 30th we were able to push on once more, and arrived back at the ship on February 3. Mr. Shackleton has since practically recovered, but both the doctors agree that he ought not to risk further exposure, and, much as I regret parting with him, I do not think the health of an executive officer of this ship should be open to any doubt. I am, therefore, sending him home by the *Morning*.

On my return to the ship, I learnt that the programme for other sledge parties, which had been arranged before I started, had been

carried out with some success and without accident. Mr. Royds journeyed again to Cape Crozier on November 3, accompanied by two men, to revisit the Emperor penguin rookery and make further observations. These objects he satisfactorily accomplished, and though the Emperor penguins had left, he obtained more specimens of the young, and had the good fortune to find an egg. The Ross sea, which had been cleared by the gale on his previous visit, was again frozen over when he arrived. The party again experienced very bad weather on the Terror slopes, being tent-bound on the 7th and 8th, and again on the 11th and 12th. The Adelie penguins had returned to their rookery and started to lay eggs, a number of which were brought back to the ship; the party returned in good health and condition on the 17th.

Mr. Armitage started on his main western trip on November 29. He was accompanied by Mr. Skelton and ten men, with a supporting party, consisting of Dr. Koettlitz, Mr. Ferrar, and seven men. They proceeded towards the glacier previously ascended, reaching a line of "sokers" which fringe its edge, extending for about 10 miles north and south, at 29 miles from the ship, on December 2.

The glacier descends between precipitous granite mountains. On December 6 they reached a point at which it turned abruptly to the south, running behind the high range of mountains visible from the ship. They had now travelled 15 miles over the surface of the glacier, and ascended 3400 feet. Skirting the ice-clad foothills of the above range, they arrived at the summit of a pass, from which to the westward a steep descent led to another glacier, which discharged its ice, after many windings, farther to the northward.

They were now 53 miles from the ship and 4000 feet above sea-level. On the 9th Dr. Koettlitz and his party returned, and Mr. Armitage, thinking the descent to the westward too steep, ascended a steep slope with the aid of tackles, intending to attempt crossing the mountains. With this idea they ascended another 1700 feet; but they realized the task to be impossible in the time at their disposal, and, returning once more to the pass, decided to attempt the descent to the glacier below. With some difficulty, and considerable risk to the sledges, this was accomplished, and they arrived on the glacier at a point 1900 feet below the pass.

They proceeded to ascend the glacier in a northerly direction towards a range of remarkably bare granite mountains, running north-west and south-east. At the foot of these the glacier formed the junction of two tributary glaciers; choosing the right-hand one, the party proceeded in a north-westerly direction, having to cross heavily crevassed ice where the inclination grew steeper.

Mr. Armitage reports—

"The surface of the glacier was, generally, much cut up; in parts like a ploughed field, in others like a cracked glass dome, through the

cracks of which no bottom could be seen. On the way up the glacier we planted a line of sticks. During a period of twenty-three days the greatest movement shown was 3 feet 8 inches."

This slow glacial movement is in keeping with other observations made in this vicinity.

Mr. Armitage continues—

"On January 2, at an altitude of 8000 feet, some of my men (six) had to be left behind, the rarefied atmosphere and exertion proving too much for them."

Mr. Armitage, with Mr. Skelton and four men, still continued to ascend, until, having gained another 1000 feet in height, they found before them a smooth, open, snow-covered plain, over which they travelled for a short way. The farthest point reached was in lat. 77° 21′ S., long. 157° 26′ E. Observations showed a magnetic dip of 84° 24′.

The snow surface was soft, with successive crusts 9 inches or 1 foot apart; there were no sastrugi.

Mr. Armitage thought he detected a slight descent in the plain to the westward, but of this he could not be certain. The whole horizon to the westward was unbroken and clear.

On January 6 the party started to return, reuniting with the detached party on the same night. One of them, McFarlane, had to be carried on the sledge for most of the way back.

On their return Mr. Armitage remarks, "We found running 'becks' of water on the east side of the glacial valley, 7 feet wide and 9 inches deep. At level places large pools were formed, sometimes 1 mile in diameter. Bergschrunds, 150 feet deep, were found at the base of the mountains; huge 'erratics' were visible on the surface of the glacier (one measured 30 feet by 19 feet by 12 feet)." To ascend to the summit of the pass, they had again to use tackles for the sledges. On the 17th they arrived abreast of the Eskers, and on the 19th reached the ship.

This journey was, I think, a very fine one, and reflects great credit on Mr. Armitage. The sledges had often to be dragged up steep places one at a time, and, consequently, the distance traversed many times. Many dangerous crevasses had to be crossed. Mr. Armitage himself fell into one of these, and was only saved by his harness, after he had fallen some 15 feet; he received a severe shaking in consequence.

As I have not had time to inquire closely into Mr. Barne's or Dr. Koettlitz's journeys, I have asked these officers to draw out a short summary of their work, which I attach hereto.

It will, of course, be extremely difficult to follow the course and proceedings of the various sledge-parties without a proper chart, but this will take some time to construct. I am glad to be able to report that there is a considerable amount of data for its construction.

R. F. Scott, *Captain.*

Discovery, Winter Quarters, February 26, 1903.

SUMMARY OF SOUTH-WEST SLEDGE TRIP, DECEMBER 20, 1902, TO JANUARY 30, 1903.

Left *Discovery* December 20, 1902, with four seamen and one stoker, two tents, two sledges, and five weeks' provisions (one week at depôt A), and one week's bag for southern party; total weight, 1148 lbs.

Arrived at depôt A, December 31, 1902; left depôt A, January 1, 1903.

Travelling towards southern visible land, and altering course to south to clear each successive rise of land as it appeared above the horizon. Passed two gaps, or straits, in the coast, beyond which (to westward) was an apparently flat horizon, land extending to southward.

On January 14, having been out fourteen days from depôt A, we turned back, the weather having been very thick for the last two days, and being very thick at the time, having got abreast of the southern of the two gaps we saw.

Weather remained thick, with the exception of two days, when a short view of bits of the land was obtained, till the 24th, when it cleared, and on the evening of which day we reached depôt A.

Reached the ship on January 30.

On the way out, on December 28, we crossed the fresh track of a single Adelie penguin, travelling east, having apparently come from between Mount Discovery and Black island; * and on the way home we crossed the track of another one, a few miles further north, and going in about the same direction.

Got rounds of angles and bearings nearly every day till January 15, when we had started back. After that date the weather was thick till the 26th, 28th, and 29th, on which dates I got rounds of angles.

The health of the party was good. Every one wore goggles all the time, and I did not have occasion for any medical treatment.

MICHAEL BARNE, *Lieut. R.N.*

SLEDGE JOURNEYS—REGINALD KOETTLITZ.

1. *For the purpose of investigating the rough old ice and esker-like lines of rock débris which pass to north from "Black" and "Brown islands."*

September 24, 1902.—Mr. Bernacchi, Mr. Daily, and I left on this date, course direct for middle of "Brown island;" reached "old ice" at

* *White island* is that described in my journey as lying to the south-east.

Black island is the wind-swept one to the south-west.

Brown island is another of browner basaltic rock situated at about the same distance south-west by west.

Mount Discovery is a very conspicuous isolated conical mountain, nearly 10,000 feet in height, and presenting the same aspect in all directions. It is viewed from the ship between Black and Brown islands, at a distance of 34 miles.

The Bluff is the temporary name given to the conspicuous cape to the south which limited our view of Victoria Land before the sledging commenced.

R. F. SCOTT.

noon, and outskirts of rough "old ice" by 2.30 p.m.; arrived at esker-like lines following day: 17 geographical miles—some of heaps of *débris* 160 feet high (by aneroid); ice so rough we were obliged to go south to "Black island," which was reached on 27th. Ascended north-west promontory of island on 29th; found a channel apparently existed between "Brown island" and Mount Discovery, which is choked up with lines of rocky *débris* and broken ice, also that a channel separates these from "Black island." Saw that a glacier of some size comes down from the mountains behind Mount Discovery, and it appears to be the source from which the eskers are derived. "Brown island" seemed inaccessible to a sledge party, owing to this side being surrounded by lines of rocky *débris* 3 to 5 miles from its base. Returned to ship down newly found channel on west side of "Black island"—which ends in the barrier to the southward, with several tide cracks running, at its apparent junction, from "Black island" towards the Bluff range—round south side of "Black island;" and reached ship on October 2.

2. *Short sledge trip to Erebus bay, to ascertain whether an Emperor penguin rookery existed anywhere there or not.*

November 3.—Mr. Skelton, Hare, and I left the ship on this date, reached glacier snout by 2 p.m.; examined the marks placed upon it for ice-movement; proceeded and camped on the north side of the outer and larger rocky razor-back island well in the bay. Walked to the spit of rocky land to the north-east at the foot of the mountain; ascended 150 feet and examined all round with binoculars; no signs of any rookery. On return journey explored that portion of inner bay north of glacier snout, and reached ship on evening of November 5.

3. *Return journey of western supporting party.*

December 10.—Mr. Ferrar and I, with seven men, left the main party at "Separation ridge" on above date, upon our return to the ship.

On our march we occasionally separated and examined the hills on each side of our route. We found that those more inland were composed of granite rock, split and broken, as well as weather- or wind-worn into extraordinary shapes. The lower or more outer hills consisted of quartz, etc., with basaltic dykes cutting through them. The weather was too foggy to do much upon the sea and old ice in the bay. Reached ship on 18th.

4. *To attempt to reach and ascend "Brown island" and examine condition of things on western side.*

December 29.—Mr. Hodgson, Mr. Ferrar, and I left ship on this date, making our way towards centre of "Black island" in order to avoid the "rough old ice" as much as possible; reached that island after much difficulty, owing to the rough ice and water (due to thaw) on the

31st; continued along the north shore of "Black island" past the north-western point, across the channel, to within 3 geographical miles of "Brown island;" here the sledges could go no further. Walked over the rough lines of rocky *débris* to the island, wading channels in places; ascended to summit, 2750 feet, which was found to be a volcanic cone, with crater. Saw that the glacier at the back of Mount Discovery was not the source of the esker-like lines of rock *débris* and ice-worn boulders, but that it passed away in a long tongue along the shore of the mainland towards the north; also that a long deep bay existed between "Brown island" and the mainland, having Mount Discovery and the plateau mountain at its head; that the channel (?) between "Brown island" and Mount Discovery is choked with lines of heaped-up *débris*.

1903.—Returned to ship round the south of "Black island," and reached it January 8.

5. *To "Bluff," to ascend it and ascertain the lie and general arrangement of the pressure ridges, etc., as the ice passes that point.*

January 14.—Mr. Ferrar and I left ship; found going very heavy, so did not reach the "Bluff," though our course was direct for it, till the 20th. Camped upon the outskirts of long esker-like lines of rock *débris* and broken rough ice, which fringes this side of the mountain range for half a mile or more in extent. Weather now very stormy; could not leave camp till the 23rd. Walked to the land over the *débris*, crossing two movement or shearing cracks along the base of the land; ascended a shoulder near the "Bluff" end to a height of 300 feet, and had a fair view; could go no further, as the weather continued bad, and looked as though getting worse, so returned to camp; left, on return journey, in a blizzard, used sledge-sail, and arrived at ship on 26th.

NOTE ON THE ANTARCTIC SKETCH-MAP, p. 120.—As the complete charts showing the results of the surveys made by Captain Scott and the officers serving under him have not yet been received, the map of the antarctic regions which accompanies this paper must be considered as only provisional. It has been prepared from all the information at present available, including the report which Captain Scott has addressed to the presidents of the Royal Society and the Royal Geographical Society. A rough sketch of the winter quarters of the *Discovery* by Lieut. Barne, and another of Erebus and Terror island by Lieut. Royds, have furnished the basis for the enlarged inset plan, but the remainder of the new work has been drawn from letters and reports, in which are, however, given the latitudes and longitudes of several positions. The track of the *Morning* has been approximately laid down, from a preliminary chart on a small scale, by Lieut. Evans, and sent home by Captain Colbeck. Lieut. Shackleton has, since his return, looked over a proof of the map and made several corrections, but until the complete charts, based upon numerous observations and careful surveys, arrive, it is, of course, impossible to give anything more than an approximate idea of the geographical work of the expedition. Upon the present map, the newly discovered land is shown in red, while the remainder of the coast-line has been principally taken from the admiralty charts and other material.

THE SECOND NORWEGIAN POLAR EXPEDITION IN THE "FRAM," 1898-1902.*

By Captain OTTO SVERDRUP.

Upon learning that Messrs. Axel Heiberg and Ringues Brothers were willing to defray the costs of a polar expedition under my guidance and direction, I petitioned the Norwegian Government to lend me the arctic vessel *Fram*. The Government at once placed her at my service, while the Storting generously granted 26,000 kroner (= £1445) for the renovation of the ship and the construction of a new saloon forward, two working-cabins, and six berths for the officers and scientific staff. The *Fram* was a first-rate boat before these alterations were made. Prof. Nansen had asked Mr. Collin Archer to make her strong, and strong she unquestionably was. But now she was better than ever; and though she was not so severely tried on the second occasion as she was on the first, still she did not escape without two or three pretty severe tussles.

The original object of the expedition was to spend the winter in the arctic regions, and by means of sledge-expeditions carry out the scientific exploration of the north-west coast of Greenland. But in case the ice should prove unfavourable for this purpose, or we experienced difficulty in penetrating through Kane basin, the generous authors of the expedition gave me a perfectly free hand to turn my attention to other fields. Thus I was under no obligation to follow a predetermined and unalterable plan.

The *personnel* of the expedition consisted of the following, in addition to myself: Captain Victor Baumann, second in command, who was appointed first lieutenant in the Norwegian navy in 1895. He had charge of the magnetic observations, having studied magnetism at Berlin and Wilhelmshafen. The "mate" was Mr. Oluf Raanes, who had served as fisherman and seaman on the Coast of Norway all his life. The cartographer was Captain (*Ritmester*) Gunerius Ingvald Isachsen, a cavalry officer in the Norwegian army. The botanist was a Swede, Mr. H. G. Simmons, who had distinguished himself by a botanical expedition to the Færoes. The zoologist was Mr. E. Bay, a Dane, who took part in Lieut. Ryder's expedition to the east coast of Greenland in 1891. Dr. J. Svendsen, a native of Bergen, was the medical man of the party. The geologist was Mr. Per Schei; and the chief engineer Mr. Karl Olsen, with Mr. Jacob Nödtvedt as his principal assistant. The other members of the party consisted of Messrs. P. L. Henriksen, who accompanied Prof. Nansen in the *Fram's* first voyage; I. Fosheim, our hunter; A. H. Lindström, who acted as cook and steward; S. Hassel, R. Stolz, and O. Braskerud—the last two and Fosheim acted as firemen.

* Read at the Royal Geographical Society, April 27. Captain Sverdrup's completed map will be issued in a later number of the *Journal*; in binding it should be inserted at the end of this number.

We left Christiania on June 24, 1898, for the Danish colonies on the west coast of Greenland, where we took on board sixty-six dogs, which the Royal Greenland Trading Company had kindly bought ready for us. On August 7 we got set fast in the ice of Melville bay, and were kept there until the 13th. After getting out into open water again, we hardly saw any further trace of ice. Watch after watch passed, and we still had the open sea in front of us, and I was beginning to calculate how many days we should need to go through Kennedy channel and Robeson channel. But I was reckoning without my host. The drift-ice was not so very far off after all, for we encountered it in great quantity in the northern end of Smith sound. At first we tried

VIEW FROM SOUTH BAY AT HEAD OF CAÑON FJORD.

to creep along by the coast of Greenland, but were stopped by the ice, which lay for a long distance to the north, close-packed and motionless, absolutely impenetrable to any ship that ever was built. There was no help for it; we had to turn round and go back the same way we came. As soon as it was practicable, we crossed over to the west side of Smith sound, and made another attempt to penetrate northwards along the coast of Ellesmere Land; but we were again stopped, on August 17, by the drift-ice, close to the little island of Cocked Hat.

It was still early in the year, and we hoped the ice would loosen again, so that we might yet be able to push on farther north before the autumn came to an end. But we were doomed to disappointment. Day after day passed, and the ice never moved, and so effectually

blocked our passage. Meanwhile the nights began to be cold, a warning that winter was coming, which suggested to us the advisability of looking about for winter quarters. These we eventually found in a small sheltered cove in the northern part of Rice strait. At that time we were still uncertain whether Hayes sound really was a sound or only a large system of fjords, and as soon as the ice bore, which it did early, for the frost was very severe, we set about exploring the interior parts of Hayes sound.

In the following spring we made two expeditions across Ellesmere Land to its west coast. Bay and I, starting from the inner extremity of North fjord (Nord-fjord), travelled the whole way over bare ground, and came eventually to a large fjord which penetrated due east. Unfortunately the weather was not clear, and we were unable to see far; but what we did see distinctly suggested that we were standing at the head of a very large fjord, and that, further to the west, it sent off still larger side fjords to both north and south. But as we had been unable to transport overland a sufficient supply of food for ourselves and the dogs, it was entirely out of the question for us to think of pushing our investigations further. Meanwhile Isachsen and Braskerud started to cross the glaciated portion of Ellesmere Land. Keeping the whole time to the inland ice, they came at length, near the west coast, to a broad belt of bare ground, which stretched right down to the sea, and prevented them from getting any nearer to it. They also saw a large fjord with some islands in it.

In the year 1899 the ice was again extremely unfavourable in Kane basin, filling it entirely from side to side in a densely packed mass; and in those waters, where the ice is almost wholly without movement, you have to exercise the very greatest care lest you get set fast in it. If you do, you will probably have to stay there the whole year, or perhaps even longer. In the condition in which the ice was that summer, if I had attempted to penetrate it, I should almost certainly have set the *Fram* fast, and that I did not wish to do at any price. For if we did get caught, we should use up during the winter such a large proportion of the dogs' food, that, should an opportunity offer in the following summer for pushing on north, we should be unable to do so. For the journey round the north coast of Greenland, and then down its east coast as far as Sabine island, would necessarily require a large number of dogs, and consequently large supplies of food—larger than we should then have at our command. As it was, we did get ice-bound several times; but only in the outer fringes of the pack, so that there was no real danger, for we very soon drifted south down Smith sound, and so got free again. We made several attempts to penetrate northwards, but all ended the same way: we were carried down Smith sound, and so out into open water.

Accordingly, on August 22, we decided to leave Smith sound and

turn southwards into Jones sound. For it was by then in the highest degree doubtful whether the ice would loosen sufficiently to allow of our getting further north, and if we remained in Smith sound, there was a risk of our being frozen in for another winter. On the other hand, we knew that there were several extensive stretches of unexplored land lying north of the point where Inglefield turned back in 1852, and thence up to Greely fjord. Belcher, for instance, saw land due north from Table island, which he called North Cornwall. Besides which, there were many reasons for supposing there existed several islands or patches of land in the big bay between Prince Patrick island and Grant Land. In Jones sound we were overtaken by bad weather, with thick

FROM HELL GATE.

fog, and were at last driven to anchor in a fjord which we called Havne (or Harbour) fjord. This, so far as we were able to judge, was somewhere about the spot where Inglefield turned back in 1852, and whence he believed the coast-line ran back in a northern direction.

Next spring we resolved to establish a depôt as far west as we could get, so that it might serve as a base for future operations. We succeeded in advancing some 60 odd miles west, but were unable to penetrate further, owing to there being open water as far in that direction as we were able to see. At that point, then, we made our depôt, and christened it Björneborg. On our way back we put into Moskus (Musk) fjord, to see if we could find any game, and were fortunately able to bag twenty-six musk-oxen, which we conveyed in

the course of the ensuing autumn the 75 miles which still remained to be traversed to reach the *Fram*.

In the spring of 1900 we sledged west, nine of us, each with his team of dogs. Of these five men were to travel ten days from Björneborg and then return. It turned out that the coast, instead of trending to the north at Sir Inglis peak, continued west all the way to North Kent. It was terrible work forcing our way along close to the coast until we got through Hell Gate, which is always kept open and free of ice by the powerful current which flows through it. To the north of this sound the coast inclined to the north-east, and we followed it as far as Big Bear cape (Store Björnekap), which we at first took for an island, but which eventually proved to be a peninsula. We called the bay which opened to the west, Norwegian bay (Norskebugten). Owing to the mist, we were unable to see very far ahead, but once or twice, when the fog temporarily lifted, we perceived that the coast again turned west, and in the far distance formed the large promontory which we named Cape Sydvest. We thought the coast continued steadily on in the same direction, and suspected Cape Sydvest was on a large island, which was separated from King Oscar Land by a sound. King Oscar Land was the name we gave to the land going northwards from Inglefield's northernmost point.

On March 31 we reached the north side of Norskebugten, almost immediately opposite Eureka sound. There we parted from the five men who were to return to Björneborg, and thence escort two others of our party, namely, Schei and Henriksen, through Hell Gate to the north side of North Kent, whence they were to make an expedition to the Graham islands, and after that explore the large fjords which lay to the north of Norskebugten. After getting through the sound, the cold had become intense. Indeed, the morning our escort left us, we thought we would console ourselves for the parting with a drop of spirits. But though we pulled and pulled at the brandy-flask, not a drop of the liquor could we get. The spirit was frozen into a solid. However, we picked it out with a piece of sharpened wood, and each man had a spoonful of frozen brandy. The dram was intended to warm us, but I can't say that on this occasion it had precisely that effect. Although for some time the cold was terrific, we suffered no harm, a circumstance I attributed principally to the fact that we were provided with double tents. After we got a little better seasoned, and learnt how to take care of ourselves, we succeeded in almost entirely avoiding the moisture which adheres to the clothes in those climates, and which has generally occasioned such discomfort to all previous arctic travellers. Owing to this cause, we were generally pretty comfortable on our sledge journeys. Continuing our route west, towards Cape Sydvest, we had the same difficulty in making headway that we had had ever since we left the sound. It was as much as ever we could do to manage 7 or 8 miles in a day. Beyond Cape Sydvest

the coast turned towards the north-west, and the four of us who were now left pushed on further, notwithstanding the mountainous character of the country, until on the morning of April 15, just as we were setting off for the day's tramp, we discovered fresh land due west.

We agreed to separate, Isachsen and Hassel proceeding to explore the new land we saw to the west, while Fosheim and I continued our sledge tour. The former, after exploring the new land, were to cross over the large bay which lay on the north side of Cape Lev-vel, where we separated; for this bay extended, we saw, a long way to the east, and it was possible it might end in a sound that would bring us through to more easterly waters. But if they failed to discover any such sound,

FROM HELL GATE.

they were to return the same way they went, and visit the large fjords which we perceived opening to the north of Norwegian bay.

Fosheim and I continued, then, towards the north; but, the weather still proving bad, we made even shorter days' journeys then we had counted upon. We were, however, allured on by the continual hope of reaching the northern extremity of the land, and finding there a sound or fjord which would take us east into Greely fjord, or into the waters we had visited in the spring of 1899. But time after time we were disappointed, and on May 7 we were compelled to turn back in about 81° N. lat. and 95° W. long., owing to our food and that of the dogs beginning to run low. The coast still continued to follow the same direction as far as we could see—that is, for some 15 miles or so

further north. On May 7 we set out on our return journey, and on June 3 were once more on board, after an absence of seventy-six days.

On June 19 Isachsen and Hassel returned. They had made a short visit to the new land westaway, and on their way back had ascertained that there was no sound stretching to the east from the large bay that lay north of Cape Lev-vel. From Norskebugten they entered what they took to be a large fjord running towards the north, and followed it up very nearly as far as 79° N. lat., or, in fact, until they judged, as well as the incessant bad weather would let them, that they had reached the head of it. After that, in the same way, they travelled to the extremity of the large fjord which penetrated westwards. Then continuing south along the edge of the land that lay to the east, they passed, but did not enter, a little north of Björnekap Land, another broad fjord which pointed towards the south-east.

Schei and Henriksen returned from their journey to the Graham islands the day before we reached the ship, having been absent seventy-five days. They too had entered the same large fjord that Isachsen and Hassel had done, but had not gone further north than Björnesund, in about 78½° N. lat. On their return journey they crossed over Björnekap Land, and struck Norskebugten a little west of Store Björnekap.

As soon as the ice broke up, we steamed west and went up Cardigan strait, and on August 15 once more got fast in the ice off the north shore of Grinnell island, (not Grinnell Land, of course). But, after drifting backwards and forwards for about a month, we came free again, and steered to the head of Gaasefjorden (Goose fjord), and there pitched our winter quarters for the third winter.

Our sledge journeys of the spring preceding, especially after the results we obtained from them had been embodied in map form, convinced us more and more that there must be a fjord or sound connecting the northern part of Norskebugten with Greely fjord; and if, as we believed, we now possessed a fairly accurate knowledge of the waterways to the west of Björnekap Land as far north as lat. 81° N., it was tolerably certain that the sound in question, supposing it really did exist, must start somewhere farther east. We concluded, therefore, that it was in all probability a northern branch of the great fjord which went in a south-easterly direction from Björnekap Land—that is to say, an arm of the fjord which both Isachsen's and Schei's parties had visited the previous season. The probability seemed to be that, after going a little way east, it would turn north, and be somehow connected with the waters which we had discovered when we went overland west from Hayes sound during our first year. And it also seemed probable that the same fjord would prove to be connected with Greely fjord. These problems demanded a solution at all costs, and I determined to tackle them myself. Whilst I was doing this, Isachsen and Hassel agreed to return to the new land we had discovered westaway, and to

which we gave the names of Ellef Ringnes Land and Amund Ringnes Land. Even before the autumn closed we attempted a reconnoitring trip to the north, but were unable to surmount the difficulties incident to the constant bad weather, and the repeated breaking up of the ice. As far as we could see from Nordstrand, almost the whole area of Norwegian bay was a bright blue sea.

In the spring of 1901 our first proceeding was to travel to Baumann fjord, and establish there a depôt, and thence journey some distance to the north. Both going and returning we entered the fjord which, on the south of Store (Great) Björnekap, cut eastwards into the land, and, crossing over an isthmus near its head, came to another broad fjord, which

VIEW FROM BERTSTAD FJORD.

penetrated first eastwards and then due north. At first, we were naturally disposed to think this was the sound we were in search of; but after driving up it for some days, we became convinced not only that it was a cul-de-sac, but also that it was impossible there should be a land passage from this fjord in the direction we had anticipated. There was no alternative: we had to turn and go back the same way we came. Heading our dogs towards the north-west in the direction of Storfjorden (Great fjord), we entered a long narrow rift or waterway, which struck off from the east side of this fjord and led towards the north. But here again we were disappointed. It too was apparently a cul-de-sac, and terminated at the foot of a precipitous mountain wall, which it would be impossible to climb. We called this Trold fjord, and

well it deserved its name; it was an ugly place, being shut in on both sides by high and gloomy walls of rock, which wore a very threatening aspect. Here again there was manifestly no possibility of advancing further by land. However, as we had already come so far, we decided to pursue the fjord to its extremity. If fortune would only favour us, we might perchance hit upon a little glen or gap of some kind that would take us to the north. On we went then, and just as we were spinning round a projecting cape, suddenly the mountain wall opened like a doorway, and there, straight before us, was a valley which ran first to the east and then to the north. We had no hesitation in following up the valley, and after some difficulty we succeeded in striking a large fjord on the north side of the land. It was, we felt perfectly certain, one of the waterways we had visited during our first spring, and so we pushed boldly on. We were two sledging parties travelling together, the intention being to separate as soon as it should appear expedient to do so. This, then, was the moment to do it. Accordingly we parted company on May 4 near the Blaamanden. Whilst Fosheim and the mate travelled northwards towards Greely fjord, along the land that lay to the east, Schei and I stuck to Axel Heiberg Land, intending to push on as far as we could towards the north. We advanced as far as lat. 80½° N. without change of direction; then, however, the coast turned suddenly towards the west, and after we had proceeded some distance farther, we came to ice which, especially as the weather was at the same time so bad, we were unable to get over. Hence we were compelled to turn back long before we expected to have to do so.

When the weather cleared up, we ascertained that there was a broad sea-channel running towards the north-west, and that Axel Heiberg Land extended as far to the north as we were able to see. The northernmost point we reached was Smörgrautberg. Looking hence, we perceived that Greely fjord penetrated Grinnell Land towards the north-east, and was confronted on the west by an imposing mountain chain, which for almost the entire distance that we could see descended perpendicularly into the ocean. There were also several fjords cutting into the land in a northerly direction. On the other hand, Heiberg Land, so far as we were able to command a view of it, was relatively low, scarce rising more than 1500 to 2000 feet above sea-level, and between these altitudes and the sea stretched a wide belt of actual lowlands. Although Heiberg Land held out every promise of an abundance of game, we were, as it happened, still well supplied with provisions; and as, besides, the season was getting on, we thought we could employ our time to better advantage by exploring more thoroughly those parts of the country which lay to the south of us. On our way north we had scarcely given ourselves time to stop anywhere—our one object had been to push on and get as far north as we possibly could. However, we were concerned

GULL MOUNTAIN ON WEST SIDE OF GOOSE (GAASE) FJORD.

not merely to determine the boundaries of Heiberg Land, we desired also to explore it. It was penetrated by several large fjords from various directions, and it would not be without interest to explore these somewhat more closely.

We started on our return journey on May 13. Immediately south of the Blaamanden, the place, it will be remembered, where we separated from our two companions, Fosheim and the mate, but on the other side of the fjord, the flat lowlands were cut into by another large but narrow fjord-like inlet. It appeared to penetrate to a great distance, but how far exactly we were unable to see owing to the low elevation of the land. This was a point we wished to clear up; besides, it would be interesting to examine the wide lowlands which stretched away from the inlet to the south and east. The west side of the inlet was, on the contrary, shut in by high mountains, amongst which I fancied for some time I could perceive glaciers, though it turned out subsequently that I was mistaken. One night, whilst we were still in this neighbourhood, we were suddenly attacked by a pack of about a dozen wolves. Unfortunately, our dogs were muzzled, to prevent them from gnawing their traces, so that they were unable to defend themselves, and came within an ace of being all worried to death.

On our way south, we put in at several branch fjords, believing all the time that the channel we were travelling down lay to the east of the Storfjorden. Our surprise may, therefore, be imagined when we discovered, as we did eventually, that it was Storfjorden itself we were in. The identification was, however, undoubted, for

Schei recognized again the spot where he had encamped the year before, close to Björnesund. If only we had been aware of this when we started, we should have been enabled to obtain a very different idea of the lands which lie west and north of Greely fjord. The longest of these branch fjords, which we called Skaare fjord, extended some 28 miles in a north-west direction. Whilst we were encamped at the head of this fjord, we were assailed in the middle of the night by a terrific storm, which drove us to seek shelter in a sort of cañon we had discovered on our way up the fjord. The wind was so violent, it literally blew the sledges along the ice, and at such a pace that we had difficulty in preventing them from being overturned, while the snow fell so thick and fast that we were scarce able to see an inch before our noses. However, we luckily made the cañon without mishap. Crossing the sandbank at its entrance, we proceeded a little way up the glen, and could readily have believed we were come into—paradise: it was perfectly still, not a breath of wind.

After that we crossed the Hyperite peninsula, and from thence reached the northern parts of Björnekap Land, and then travelled south along this last. At two places in this district we found big accumulations of fossils, and from Björnekap we each took a big sledge load of rock specimens home with us. It was June 18 when we got back to the *Fram*.

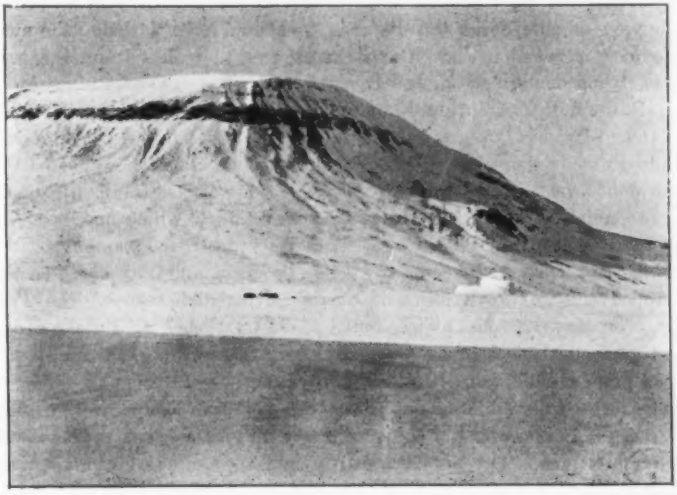
Isachsen and Hassel had reached the ship on June 7. The chief results of their expedition to the lands westaway were these: They ascertained that they extended as far west as about 106° W. long.,

TWIN GLACIER.

and as far north as approximately lat. 79°. They were almost entirely of low elevation, barely being more than 500 feet above the level of the sea. The coasts which fell away towards open water were so low, it was sometimes not at all easy to distinguish where the land ended and the ocean began.

In the mean time Baumann and Stolz had mapped Baumann fjord.

This summer we fully intended to return home, but in this we were deceived, for the ice never broke up in Gaasefjorden (Goose fjord). We tried, of course, to force our way out by ramming, but the ice was too thick. Then we attempted to blast it with explosives, but with no better result. And even if we had succeeded in breaking the ice, we should have



NORTH CAPE AT ENTRANCE TO BAY'S FJORD.

been in no better position, for there was no room to push it on one side out of the way. After a month's hard work, we gave up the attempt on September 6, having cut through about 9 miles in all, and there were still 5 or 6 miles before we could reach the open sea. This was a severe blow to us all. We had fully counted upon reaching home that autumn, and the only thing which prevented us was that paltry 5 miles of ice, for that year Jones sound was freer from ice than we had ever seen it before. However, it was no use lamenting, so we set to work at once to lay in a stock of meat to keep the dogs alive during the winter. Since we were to stay another year amongst the arctic ice, we had better turn the time to some good purpose. We could do nothing without the dogs. So we dragged a boat across the belt of ice, and got her ready

for hunting walrus. We had another whale-boat lying at our fourth camp on the north side of the land. Four of us therefore crossed overland from the head of the fjord, and sailed the second boat south through Hell Gate into Jones sound. Then we established a fishing-station at Maasefjeld, as we called the steep cape at the west side of Goose fjord. As soon as we had finished our preparations, we discovered that the first boat's crew had done precisely the same thing, but that at the moment they were absent, having gone up the fjord with a boat-load of walrus-flesh. All the time we were engaged in catching walrus, there was, fortunately for us, a stiff breeze blowing from the north, which kept the fjord open. But, the frosts setting in towards the end of September, we soon had to give over; however, we had done very well, and had quite enough meat to last us through the winter. With the view of shortening the distance we should have to sledge the meat, we took it round to the outer isthmus, and there left it until the ice was strong enough for sledging.

In the following spring, Baumann and two other men went to Beechey island to find out if there was anything left of the large depôt which the English made there half a century ago. On his return he reported that the depôt was entirely destroyed, except for a few fragments of the house which the English built. The sloop *Mary*, which had been left there drawn up on land, was also entirely destroyed; amongst other things, her mast had been sawn off. Isachsen and Bay explored and mapped the unknown parts of North Devon, and reached the *Fram* again on May 22. Meanwhile Schei and I proceeded up Eureka sound, and mapped those districts west of Greely fjord which had not already been mapped, and were back again by June 16. In this expedition we were fortunately able to determine the northern boundaries of Axel Heiberg Land, as well as the previously unknown coasts that lay west of Greely fjord. The northern parts were appreciably lower than the districts in the south, and consisted of low rounded hills and ridges (*aas*) of gravel, with immense sandbanks stretching beyond a long way out to sea. These numerous eminences, with the broad shallow valleys between, gave the region the appearance of having been originally an archipelago, which had subsequently been raised above sea-level.

The northern part of Axel Heiberg Land was not particularly high, presumably, as I have already said, not much above 1500 feet. Nevertheless, its coast fell for considerable distances vertically into the sea. Its northernmost point lay in 81° 20′ N. lat., and its westernmost in about 95° long.

From the farthest point north to which we advanced, namely Land's-Lok, in about 81° 40′ N. lat. and long. 94° W., we were unable to see land in any quarter, either towards the north or towards the west. The new islands which we discovered would therefore appear to form the natural termination of the polar archipelago that

lies north of the American continent. Although I am not prepared to assert there really does exist no land to the north or west of the point I have indicated, I have no hesitation in saying I think it extremely unlikely that land will be discovered in those directions, for as far as ever we were able to see, there was nothing but sea, covered with ice of the usual coarse arctic character. It is true, the ice was forced up against the land in pressure ridges to an almost inconceivable height; still, that is not enough to justify the conclusion that there exists no land farther west, for the drift-ice can be forced up in this way without having an extraordinary amount of sea-room behind it. In fact, I have nowhere seen such gigantic pressure-ridges as those we encountered

COAL FJORD.

along the stretch of coast between Cape Sydvest and Cape Lev-vel, and those ridges were caused by pressure coming from the west and south-west.

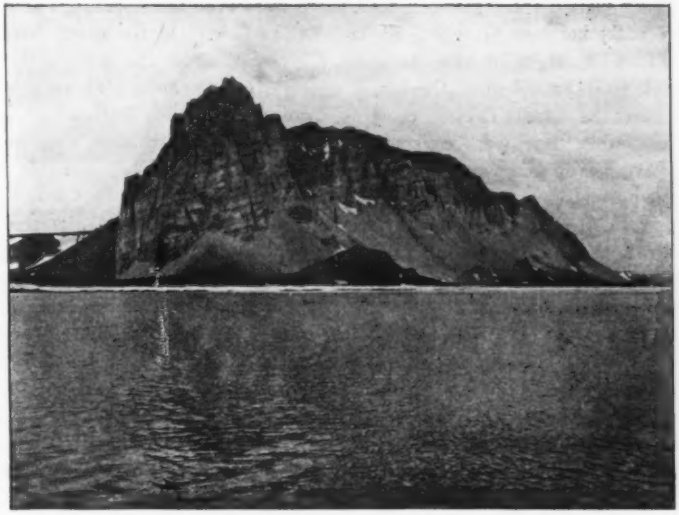
During the whole course of the expedition we never saw anything that might be described as palæocrystic ice. The entire distance from Land's-Lok to Smörgrautberget was packed with old arctic ice which had been subjected to great pressure. Its appearance suggested that, at any rate in the summer of 1901, the entire region had been covered with ice, for the great ridges were all rounded off as they would be if the ice had melted on the surface. The first year, too, that we visited that part of the coast the old ice covered every inch of the distance between the Blaamanden and the

Smörgrautberget, and even extended beyond the latter for as far as we could see. During the autumn of 1900 the ice had been subjected to an immense pressure; in fact, from the sledge-traveller's point of view I never did see worse ice anywhere. It was quite clear, however, that open channels do exist in these waters. We had unmistakable proofs of them during our trip from Land's-Lok to the northern part of Axel Heiberg Land, for there one had run diagonally right across the fjord, and we travelled the whole way down it, until we reached the land, on new ice only one winter old, and actually followed it some distance further south, for it continued to run parallel with the coast. I feel pretty certain that in most years there is here a belt of open water running from north to south, for although the ice was extremely unfavourable in the previous summer, there had nevertheless been an open channel, for in many places we found ridges of new ice pressed up between the old. There was old ice also along the west coast of Heiberg Land; but mile after mile there had, during the preceding autumn, extended a narrow channel or lane of open water, for we observed there a good deal of new ice amongst the ice-ridges. We also encountered very old arctic ice off the north side of Isachsen's Land and Ellef Ringnes's Land, where it was driven close in to the coast, and even upon it, in a series of parallel ridges of formidable dimensions.

Throughout the whole of the long distance from Blaafjeldet to Land's-Lok we did not observe the remotest sign of a glacier, nor was there any indication of glacial formation on the other side of the sound until we reached Skaarefjord, and discovered a glacier-tongue a little way up the glen. We subsequently found another glacier-tongue in Ulve fjord, and others in a few places between Hyperite peninsula and Cape Sydvest. I scarcely think that any real glaciers were found on Axel Heiberg Land, any more than on the newly discovered islands westaway. On the other hand, a considerable part of King Oscar Land is covered with glacial ice. But in no place along the actual coast did we find glacier-tongues reaching down to the sea; there was everywhere a broad belt of lowland between the glacial ice and the water, but Fosheim and the mate noted one large glacier reaching down to the water in Cañon fjord. On the south of the land the case was, however, quite different, for there the inland ice capped large stretches of country, while numerous glacial arms descended into the valleys, though seldom far enough to reach into the actual fjords.

Appearances seemed to indicate that the precipitation was very small, and I believe it is considerably less in the channels near Eureka sound and to the north of it than, for example, on the west side of Axel Heiberg Land, where it would sometimes seem to be not inconsiderable. Yet even there it is nothing like sufficient to furnish material for inland ice.

In many parts of the newly discovered lands there would appear to exist an abundance of animal life, especially musk-oxen and smaller game, such as hares and ptarmigan, as well as foxes and wolves. The larger animals keep principally to the inner parts of the fjords, because it is there they find most readily such means of sustenance as they require; but there are also several parts of the coast which they frequent in large numbers. This is especially true of Björnekap Land and Schei island. Reindeer exist away to the west, but in scanty numbers. The only other district where we met with them was in Björnekap Land, and, as a rule, their numbers decreased as we advanced north. On the west side of Axel Heiberg Land we again saw numerous



BOAT CAPE ON NORTH DEVON.

traces of reindeer, but no indication of musk-oxen. All the same, I do not doubt that musk-oxen would be found by proceeding a little way up the fjords, for we had abundant evidence that animals of all kinds were plentiful enough throughout the whole of the east coast of that land. I got the impression that the reindeer are only summer visitors in those parts, and that they come there in the spring from lands farther to the west, and return again in the autumn as soon as the ice is strong enough to bear them. But this is only a surmise; I have no positive information bearing upon the point. Bears also were pretty numerous in certain localities, both in Jones sound and all the way along the coast of King Oscar Land northwards from Eureka sound. But on the west side of

Axel Heiberg Land we did not observe the slightest trace of these animals north of Cape Sydvest.

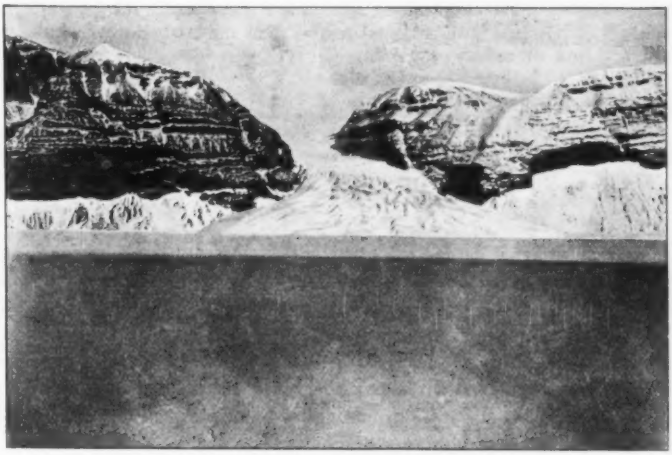
Almost everywhere we discovered the remains of Eskimo habitations, winter houses built of stone and whalebone, as well as traces of tents, meat cellars, and fox-traps. These occurred upon almost every headland along the south and west coasts, and we also came across indications of human beings having visited the inner parts of the fjords. In the course of our expedition overland from Norfjorden to Bay's fjord we several times observed the circular markings where tents had stood, proving that the Eskimo were well acquainted with that region, and had made good use of this short cut overland. On the east side of Axel Heiberg Land again we observed several indications of Eskimo having visited the region; indeed, there were even tent-markings along the coast between Greely fjord and Land's-Lok. On the other hand, we found no signs of even temporary occupation on the west side of Axel Heiberg Land. Curiously enough, at Björneborg there were, besides the usual Eskimo remains, two round towers built of stone. Presumably they were constructed by the Eskimo, although I confess I have never seen structures similar to these that they have built anywhere else.

With regard to the route which the Eskimo followed in their migrations into Greenland, it would, of course, be rash to say anything positive. Yet it is not improbable that the main stream followed a north-east direction across the North American archipelago, *viâ* the northern parts of North Devon, and thence north along the coast of King Oscar Land, through Eureka sound, into Greely fjord, then overland to Archer fjord, and so on northwards to the north-west coast of Greenland. Of course, this does not exclude the possibility that a smaller stream may have preferred to keep to the coast, and so gone right round Grant Land, and in that way reached the north-west coast of Greenland, whence they would continue round its north coast, and so push on down its east coast. I should also be strongly inclined to suspect that a portion of them may have crossed overland from Bay's fjord to Hayes sound, and thence proceeded across Smith sound to the west coast of Greenland, and so on further south. It must be left to the future to decide how far these points are capable of being cleared up by a scientific examination of the various objects of wood and bone which we discovered, besides the different remains and encampments, as also the solution of the age of the remains themselves.

The scientific results of the expedition have, I venture to say, been of considerable value. Meteorological observations were taken every second hour, both in summer and in winter; records were also made of the temperature of the sea and of the ice, as well as of the tidal water. Magnetic observations were made at each of our several winter quarters. Collections of the greatest possible extent were made by the scientific

staff, and they brought home with them rich and valuable materials for the study of the zoology, botany, and geology of those new lands, parts of the arctic which had never before been visited.

Stubborn and intractable though the ice was in Goose fjord in 1901, in the following year it proved just as ready to serve us. By July 30 we got out to the entrance of the fjord; but had to return, because the prevailing east wind had packed the ice together in such vast masses outside the fjord, that it was impossible for us to get through. Besides, a boat party who had gone off for the purpose of scraping the bottom of their boat, were not yet back on board. But on August 6 we said good-bye finally to Goose fjord, and on the 17th entered Godhavn



GLACIER IN BOAT FJORD.

without having met with the slightest hindrance from the ice, either in Jones sound or in Melville bay. We left Godhavn on August 21, and reached Norway on September 19, 1902, after an absence of four and a quarter years.

Before the reading of the paper, the PRESIDENT said: Our meeting this evening is one of considerable importance. We are here to receive an account of some very important arctic discoveries from the leader, the distinguished Norwegian seaman, Captain Sverdrup. I am sure you will give him a very warm welcome this evening, and also Mr. Schei, the geologist of the expedition. Captain Sverdrup, as you all know, has been well known to geographers for a considerable number of years from his work with his old friend, Dr. Nansen, and he now comes back after four and a quarter years of very hard work, which he and his companions have done resolutely and admirably. As soon as we thoroughly understood what had been accomplished, it was considered by the Council of our Society that Sverdrup

had become worthy of our highest honour. (*Addressing Captain Sverdrup*) Captain Sverdrup, on the part of the Council of the Royal Geographical Society, I am glad to be able to tell you that they have so highly appreciated your work in the arctic regions that they have resolved to grant you the highest honour we have it in our power to give, and that is the Royal Award. As you will not be able to be present at our anniversary meeting, the Council has desired me to place in your hands on this occasion the Patron's Medal of the Royal Geographical Society.

Captain SVERDRUP: I thank you very much for presenting me with this medal, and I will ask you to read my paper.

The PRESIDENT: Captain Sverdrup thinks that he has not sufficiently mastered our language for him to venture to read the paper to so large an assembly, and he has therefore requested me to do so for him.

After Captain Sverdrup's paper, the PRESIDENT said: Mr. Schei, the geologist of the expedition, has also been so kind as to communicate a short paper on the geology with reference to the physical geography of the newly discovered country. I will now read Mr. Schei's paper.

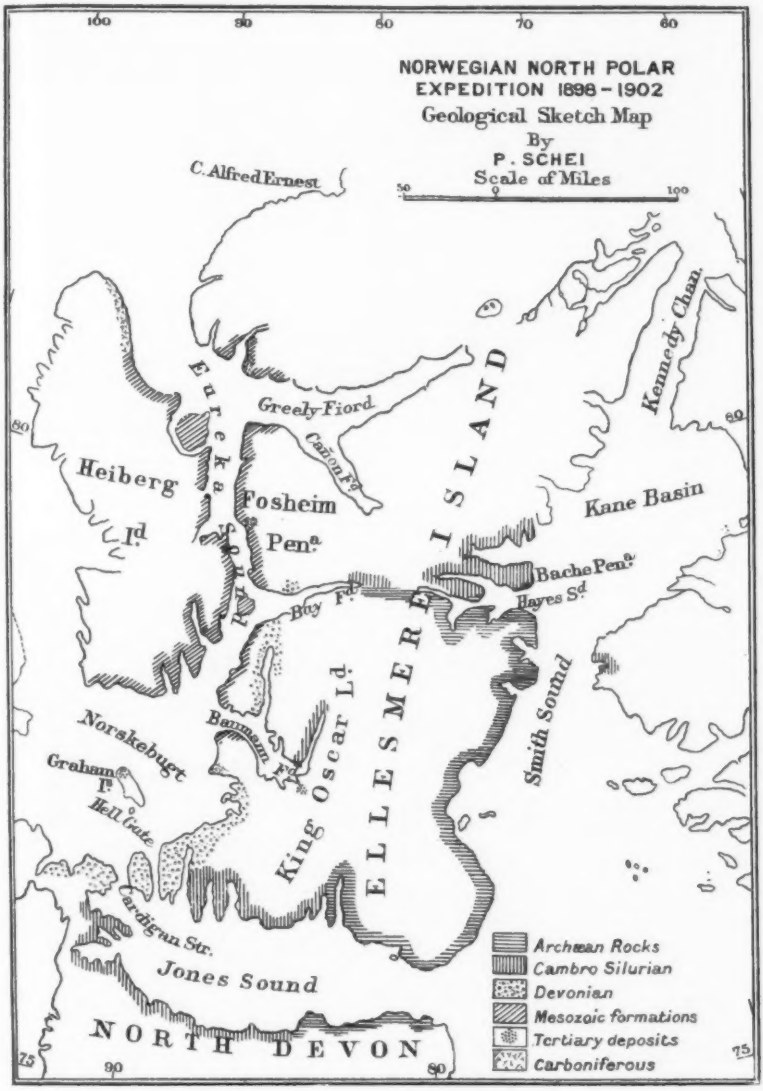
SUMMARY OF GEOLOGICAL RESULTS.

By P. SCHEI.

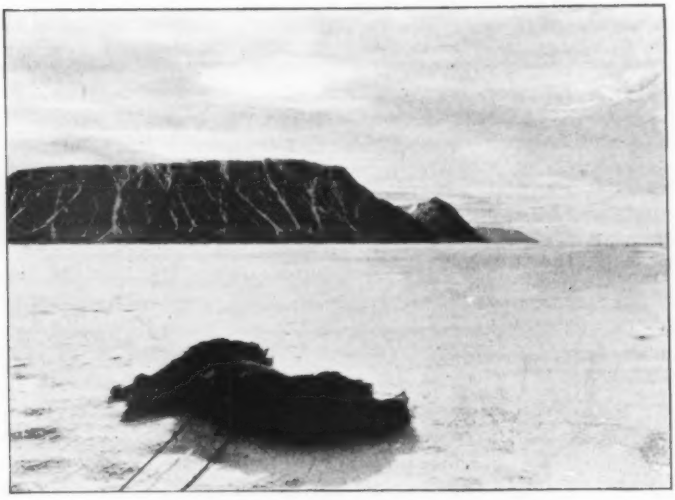
YOUR Society has done me the great honour of asking me, through my chief, Captain Sverdrup, to give it an account of the scientific work accomplished by the expedition. This request I have all the greater pleasure in complying with, because your Society, and behind it the English people, have a clear right to early information about anything there is new to be known about the regions specially visited by the Second Norwegian Expedition. For it is to both your Society, with its never-failing interest in arctic exploration, and the English people, with their unparalleled generosity in raising the necessary funds, that one of the greatest and noblest undertakings in the field of geographical exploration during the nineteenth century was carried out—Sir John Franklin's Expedition for the discovery of the north-west passage and its sequel, the Franklin Search Expeditions. It is to these last that we owe whatever knowledge we possess of the Parry archipelago. At the same time, it is but proper to mention in this connection the last exploit in arctic exploration in particular, and of the scientific investigation of nature in general, which Englishmen have accomplished in that part of the world—I allude to the expedition under Sir George Nares's command in 1875–76, which brought home so many interesting collections and observations from the east side of Ellesmere Land and Grinnell Land.

The second expedition of the *Fram* had the good fortune, under the stress of circumstances, to be forced to spend four years on the borders, that is to say, the regions lying between the parts explored by the two great expeditions.

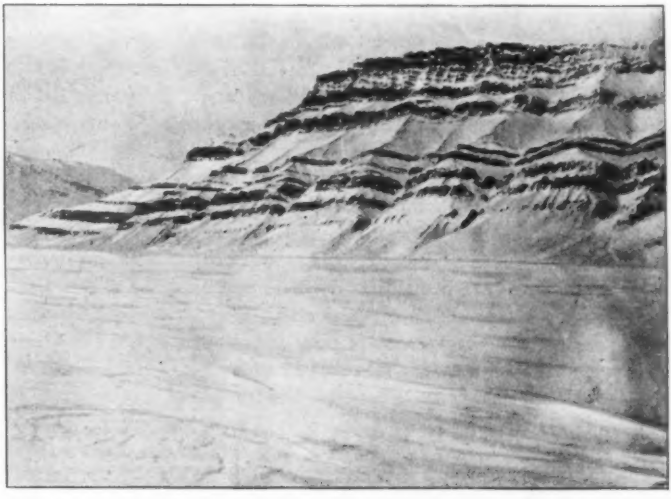
Thanks to the more stationary nature of its operations, as well as to the advantage of being able to employ more modern appliances and



methods, and above all to the use made of dogs in sleighing expeditions, the second *Fram* expedition has been enabled to collect on the whole a



ARCHÆAN PLATEAU, SOUTH-EAST ELLESMERE LAND, JONES SOUND.



SHEETS OF BASALT IN LIMESTONE AND SANDSTONE, EUREKA SOUND.

GLACIER IN BERTSTAD FJORD.

pretty large quantity of scientific material. Indeed, of such an extensive character is it, that as yet a good deal of it has not been examined scientifically, some even has not been distributed for examination. All that can be said here, therefore, is that meteorological observations, embracing observations on the direction of the wind and its velocity, the temperature of the air, its pressure and its degree of humidity, as well as the amount of cloud, were taken every second hour from September, 1898, to August, 1899; from September, 1899, to August, 1900; and from September, 1900, to July, 1902, in the several winter quarters we wintered at.

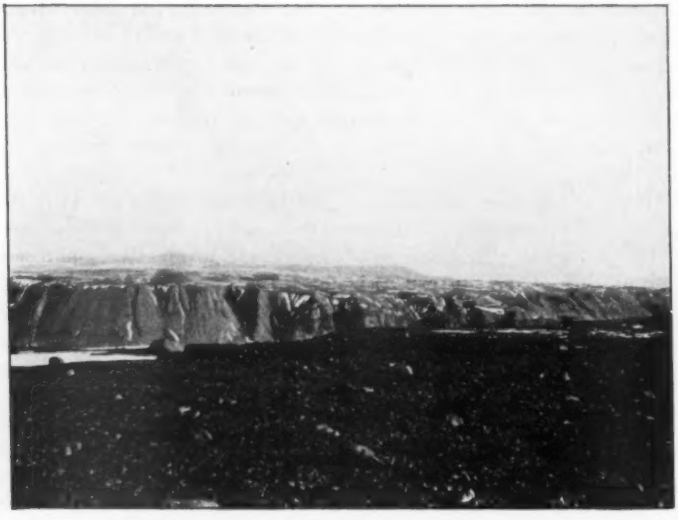
Observations were also taken of the tides at various periods, with the object of determining the magnetic force, and pendulum observations.

The zoological collections, which were made by Mr. Bay, embrace a large number of preparations and specimens, amongst them 2000 preparations preserved in spirits. Of these, the collections of the lower forms of life, especially echinoderms and phankton, may be particularly singled out for mention, both on account of their great variety and the special interest they inherently possess.

The collections of plant life made by Mr. Simmons embrace no less than 50,000 examples. The collector has reserved to himself the study of the phanerogams and algæ, leaving the remainder to be taken in hand by various specialists. This great wealth of material may be expected to yield, besides a host of individual facts, an almost complete

survey of the botanical geography of that particularly important part of the world.

As regards the geological results, here alone I am able to offer detailed information. My collections embrace specimens of Archæan rocks from Foulke fjord and the south side of Hayes sound, as well as of the Cambrian and Silurian formations, which are developed to a great thickness in Bache peninsula and on the north side of Princess Marie bay. A pretty complete collection was made of the Silurian and Devonian formations which occur in the western part of Jones sound; and they have furnished materials for determining in considerable detail the order of the series in these two formations. Most of the localities examined in Goose fjord and Hell Gate were prolific in fossils. Here we have a series the several members of which yielded 16, 11, and 22 species respectively on a first provisional examination, belonging apparently to the Wenlock and Ludlow divisions of the Upper Silurian; while the members of the Devonian series have supplied 55, 20, 13, 16, and so forth, species again on a preliminary survey. This takes no account of the remains of fishes, which have not yet been identified, though Prof. Traquair, of Edinburgh, has kindly undertaken to examine them; nor does it embrace, either, the specimens, abundant in numbers, but poor in species, of Upper Devonian plants which were gathered in three localities in Goose fjord, and which Prof. Nathorst in Stockholm has undertaken to report upon.



HIGH-LEVEL COAST FORMATION, HEAD OF BAY'S FJORD.

We also brought home an important collection of Upper Carboniferous fossils from Big Bear cape (Store Bjornekap), which have gone into the hands of Prof. Tshernytcheff, of St. Petersburg. Here are at least forty species, some of them represented by several specimens, and all of especial interest, owing to their resemblance to fossils from the Upper Carboniferous rocks found in the north of Europe.

Great interest attaches also to the collection of specimens belonging to the Mesozoic deposits of Eureka sound. Thanks to Sir Leopold McClintock, Vice-Admiral Sherard Osborn, and Sir Edward Belcher, we already knew of the existence of a few Mesozoic fossils in the Parry islands. My Mesozoic collection contains, therefore, nothing new; and as the collections are small and incomplete, they do not afford anything

TABLE-TOPPED HILLS OF DEVONIAN FORMATION, HELL GATE.

like materials for a complete summary. They do, however, prove this —that the Mesozoic deposits of King Oscar Land, Heiberg Land, and Grinnell Land are very widely distributed, as well as possessed of greater intrinsic importance than the similar deposits in other parts of the North American archipelago, since they point, as do also the Carboniferous fossils, to North European affinities rather than to American. At Cape Blue Mountain (Blaafjeld) I picked up a black shale containing a *Daonella*, and both rock and fossil are precisely similar to a rock and fossil from Spitzbergen, where Alpine Triassic is known to exist.

Prof. Nathorst says that the Tertiary plant remains which Mr Simmons has brought home from Coal fjord (Kulfjord), in Baumann fjord, are in their several ways unparalleled. Out of two or three large pieces of greyish-black clay he has succeeded in washing out portions of stems with their adherent leaves, and has mounted them upon cardboard just as though they were parts of a dried plant which was plucked only the other day. Thus he will be able to examine microscopically the structure of both the leaves and stem of plants which grew, it may be, a million of years ago in a part of the world where at the present day

there does not exist a single tree, and which have for their nearest known congeners the giant tree of California, *Sequoia*, and the swamp cypress, *Taxodium*, of Florida.

In the light of these various fossil collections, we are now in a position to interpret the history of this portion of the Earth's surface during pretty long periods.

In North Lincoln Land, and both northwards to Hayes sound and westwards as far as Harbour fjord, there exists an Archæan formation built up out of granites of a peculiar character by ancient volcanic outbreaks, and over this there flowed in Cambrian times a sea, which has in part worn away the outlying Archæan rocks. We have thick quartz sandstones in Bache peninsula and in Foulke fjord, and we have reports of still greater developments in Inglefield gulf, North Somerset, etc.

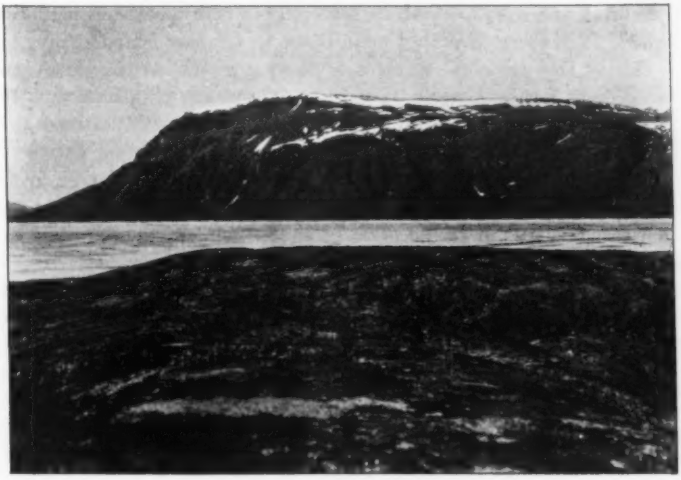
In part the Cambrian sea would appear to have washed the feet of limestone mountain walls, which were formed and deposited long anterior in water; for interpolated between and lying upon the sandstone in Bache peninsula and Jones sound there exist conglomerates of limestone and of calcareous sandstone hundreds of feet thick. After that the sea overflowed these localities, and deposited, in the Middle Silurian epoch, thick strata of limestone, at least 2000 feet deep, in, *e.g.*, Princess Marie bay and Jones sound.

During the early portion of the Devonian epoch, the formations of the deeper seas were laid down in the form of black shales and limestones; but by the close of that epoch the coasts had approached nearer together, and in the quieter deeper reaches of the estuaries fish remains settled down, along with fragments of the plants which grew on the adjacent shores, and both were buried in the argillaceous mud which collected amongst the sand and gravel along the shore.

The richly fossiliferous limestone, with embedded flints, which exists at Big Bear cape, tells us that at the close of the Carboniferous era the sea was again predominant, although of the circumstances which existed immediately before and immediately after that epoch we know nothing. Ammonite mountain, in the northern part of Bear Cape Land, records that in Triassic times the sea reached quite close up to that spot, for its sandstones and arenaceous limestones contain lamellibranchiates and an ammonite of that age. But about the close of the Triassic epoch, or a little later, this part of the Earth's surface underwent tremendous changes.

The Blackwall (Soote Vaeg), in the north of Heiberg Land, shows that volcanic craters were already in existence there in Carboniferous times, and spouted out lava, which spread itself in broad streams over the layers of limestone and flint. The existence of tuff strata intercalated between the lava-beds shows, further, that the volcanic outbreaks were accompanied by showers of ashes. However, the Carboniferous sea once more asserted its supremacy, and laid down fresh strata

of flint and limestone on the top of the tuffs and lavas. But the volcanic disturbances did not reach their culmination until after the Triassic deposits were all laid down. The Earth's crust was split by gigantic fissures, and the several areas thus formed were dislocated both horizontally and vertically, but more particularly the latter. At the same time volcanic matter burst up through these fissures and forced its way in between the sedimentary fossiliferous rocks. In virtue of their greater power of resisting disintegration, these intrusive outflows now appear in the form of black strips and vertical walls, interpenetrating the more yielding contours of the sandstone and limestone strata. This



HARBOUR FJORD, JONES SOUND.

volcanic activity, as well as the most violent dislocations, seemed to have been confined to the immediate vicinity of Eureka sound.

Ellesmere Land and King Oscar Land have the contours of a table-land. The younger formations of North Lincoln Land are separated from the Archæan rocks. The level surface of the latter lies at the same elevation as the subsided sedimentary strata on the west and the north. But at Eureka sound the plateaus have steep vertical sides, and have been disturbed by the eruptive outbreaks, imparting a more rugged aspect to the landscape, with sharper edges and isolated peaks.

The Miocene sea deposited its clays and sands in the valleys and depressions of the dry land, which owed their existence to dislocation and erosion. It is in these deposits that we have found the splendidly preserved remains of former vegetation to which I have already alluded,

those allied to the giant *Sequoia* of California and the swamp cypress of Florida.

The youngest evidences of marine action are the sands and clays, with sub-fossil remains of existing marine organisms, which were observed at an altitude of 650 feet all round the coasts of Ellesmere Land. The altitude to which that sea rose is indicated for the most part by the loose materials of the marine terraces, although traces of it are not wanting in the hard rock, namely, in the form of a flat shore formation, in, *e.g.*, Baumann fjord and to the north of the Seventeenth of May hill (Syttende Mai Haugen). The same phenomenon is exhibited in the foreland, which, to the breadth of 1 to 3 miles and to the height of 650 feet, encircles the plateau, especially in many localities in Eureka sound. It is also remarkably plain to see on Graham island.

One of the principal features of these regions is, of course, their glaciation. North Lincoln Land is, as we know, glaciated. The interior is covered by a more or less continuous sheet of ice, and from it big glaciers push themselves down into the sea from Fram harbour in Jones sound right round to the inside of Hayes sound, although in the latter locality there are considerable areas entirely free from ice. The same thing is true in even a more extended sense in the districts bordering in Jones sound. The glaciation becomes less pronounced as one advances west. First the glaciers retreat from the actual coast, and finally disappear altogether. The higher parts of the interior of King Oscar Land are, it is true, covered with ice, but it is so thin as to be unable to give off any glaciers. In the usual acceptation of the term this land is not "glaciated," and the same thing is true of the west of Grinnell Land and of the greater part of Heiberg Land. The only exception in the case of the last named is the south-east corner, where, however, scarce a single glacier reaches the sea. So far as I am able to judge, this reappearance of glaciation in the regions farther west is due to the relatively greater precipitation, but principally to the configuration of the country. I fancy the wind drifts the snow together and deposits it on the short, steep slopes which are here found to exist, but nowhere else. You never find a thick ice-cap on the level heights or on the top of the plateau.

From what is stated above, it will be inferred—what is, indeed, true—that in the summer extensive tracts of country are entirely free of both snow and ice.

After examining the unglaciated parts of the region with the view to discovering whether they may possibly have been subjected to glaciation at some earlier period, I arrived at results of a negative character. I nowhere observed *roches moutonnées*, neither did I observe striæ or scourings. Nay, further, I did not perceive any loose materials that could with any degree of likelihood be ascribed to the effects of glacier ice. Moreover, in several places I noticed marine terraces at a

great height above the sea, running immediately in front of the existing glaciers, and in such a position that it is scarcely conceivable they could have been formed with the sea at its corresponding elevation if there had existed glaciation of even the same intensity as that which now obtains, to say nothing of a greater intensity. I believe I may venture to say, that in those regions the existing glaciation represents a maximum, such as has never been attained before, and if this conclusion should turn out to be sound, it is one, I need hardly say, of considerable importance from the point of view of physical as well as of biological geography.

After the reading of the Papers, the PRESIDENT said: We have present with us this evening several of our old English arctic officers, who all, I am sure, are delighted to welcome Captain Sverdrup, and I hope some of them will address the meeting.

Admiral Sir LEOPOLD M'CLINTOCK: I very gladly avail myself of this opportunity of expressing my, not merely satisfaction, but pleasure, at hearing the report of the expedition, and I desire heartily to compliment Captain Sverdrup upon the great success which has attended his efforts. His well-sustained energy for fully four years has brought about results which are of very great use to geographical knowledge. He entered a part of the arctic regions which we English people thought to be peculiarly our own. The Parry archipelago had been discovered by Sir Edward Parry. I may say a word or two before we leave the Parry archipelago: its southern side was discovered by Parry eighty-three years ago, and exactly fifty years ago the northern part was discovered by our own sledge parties when searching for Sir John Franklin. I am glad to notice that the Sverdrup methods of exploring by sledges were very similar to those we used in our own expeditions, but with this remarkable difference, that he was supplemented by dogs to draw the sledges; we had to draw our own. We looked upon that part of the arctic regions as so peculiarly our own that we spoke of it as if the Queen's writ was free to run through it even to the north pole. But we can no longer make that boast; Captain Sverdrup has been there, and he has discovered other lands farther north, so that we cannot look for any immediate increase to the British Empire in that direction. This evening must be given up altogether to geographical matters, and I heartily congratulate Captain Sverdrup on his great success and wonderful achievements, and I hope he may long live, and enjoy good health and wear his honours and distinctions.

Admiral Sir VESEY HAMILTON: I have very little to add to what Sir Leopold M'Clintock has said of the admiration in which we hold Captain Sverdrup and his followers for the way in which they performed their work. We may say of Captain Sverdrup that he is the Captain Cook of arctic expeditions. He has brought back all his men but one. They possessed advantages which we did not possess in the way of dogs; we had some, not many, but he has not described anything with regard to the difficulties of dog-driving. We once had an admiral 150 years ago, and it was said of him that "he was never known to swear, not even at sea," but he was never known to drive a dog-sledge, or he probably would have. In my earlier days we had not the advantage of being able to take photographs, and most of us were not of very big stature. But those photographs which we have seen on the screen make the members of the expedition look like giants. The work that has been done by Captain Sverdrup has my great admiration, and I cannot speak of it too highly. One thing, it shows the enormous uncertainty of

ice-navigation, for, after spending two years in a harbour, there were but 5 miles of ice between them and the open sea, and but for that 5 miles of ice they would have been able to get back one year earlier. Dogs were first introduced into the arctic regions by Captain Penny, who was in charge of an expedition by the Admiralty in 1850. One curious thing about these dogs was that they were divided amongst the two ships, but the men who fed the dogs on the one ship did not dare go near the others. They are a very peculiar race are Eskimo dogs, for if anything happens to the leader of a dog-sledge, he pitches into number two, and number two pitches into number three, and so it goes on to the end. It is a curious fact that in this room at present there are arctic navigators representing various expeditions from 1847 up to the present time—fifty-five years—and if we go back a little further, we may add Sir Joseph Hooker, who accompanied Sir James Ross in 1837 in his antarctic expedition, so that we can trace back ice-navigation for sixty-five years, and I do not think there are many kinds of work that can go back so many years. I can certainly say, in the name of all arctic navigators, that we welcome Captain Sverdrup here most heartily, and congratulate him on the successful conclusion of that expedition.

The PRESIDENT: We now come to the arctic officers on the eastern side, and we will begin with Admiral Markham, who I hope will address the meeting.

Admiral A. H. MARKHAM: Like my old friend, Sir Leopold M'Clintock, I am only too glad to avail myself of this opportunity of offering my congratulations personally, and I think I may also say in the name of the officers who served under Sir George Nares, our congratulations on the excellent geographical work that has been performed by Captain Sverdrup during his recent expedition in the arctic regions. We were all very much pleased and very much relieved when we heard of the safe arrival of the *Fram* last September in Norway, after having been lost sight of to the world for something over four years, and the pleasure we then felt was enhanced when we heard of the excellent work that Captain Sverdrup had done in those regions—work which displayed that spirit of endurance, that spirit of pluck, and that determination which we were well assured, from our knowledge of what Captain Sverdrup had already done in the arctic regions, he possessed. Thoroughly realizing as I do the great difficulties he had to contend with, I can all the more appreciate and admire the skill, the energy, and the perseverance which he and his gallant followers displayed in overcoming those difficulties. Sir Leopold M'Clintock has taken us back fifty and eighty years, and I can remember almost as if it were yesterday the meetings that were held in this very theatre thirty years ago—meetings at which your President of to-day was the leading and guiding spirit; meetings that were held with the object of the renewal of geographical exploration in the arctic regions. I am sorry that there is not a north circumpolar map of that date hanging in juxtaposition to the one now in front of you, so that you would be able to see at a glance the large amount of geographical work that has been performed during the period that I have referred to. What was then almost a *terra incognita*, as was shown by Captain Sverdrup just now on the screen in the region of Jones sound, has been explored, the coast-line has been delineated on your map, and now we have Captain Sverdrup coming back and giving us an account of his discoveries in a portion of that region which was a *terra incognita* in those days from Jones sound, along the west coast of Ellesmere Land, until he almost joined hands with Aldrich's farthest on the north coast of Grinnell Land. I am one of those who feel pretty sure that before many years have elapsed, such is the spirit of geographical enterprise in the present day, that we shall have a very fair knowledge of the conditions of land and ice and of sea in the polar regions. And I say polar regions in contradistinction to arctic regions, because we must not

forget an expedition now in the far south that has already done good work, and we hope is continuing to do good work, under the command of Captain Scott and his brave associates in the *Discovery*, an expedition whose despatch is almost entirely due to the never-tiring energy of our President, Sir Clements Markham. There are one or two points on which I should like to ask for information, but our President has told us that Captain Sverdrup has a very limited knowledge of our language, and perhaps it would not be fair to ask him, but perhaps Mr. Schei would be able to answer one or two questions which I should like to put. We have seen some excellent illustrations from photographs on that screen. There were one or two of sledges. Sir Leopold M'Clintock told us just now that these sledges were different from those in use in his time because they were supplemented by dogs. But I saw a big wheel on the screen, and I am not quite sure of the utility of that wheel, whether it was to guide the sledge or whether it was to increase its motive power. There was another question I should like to put. I understand that Captain Sverdrup never saw anything of what we called palæocrystic ice. He alludes in his paper, in the neighbourhood of some place with a most unpronounceable name, but which our President has just told us had something to do with butter and porridge, to the fact that there was some very heavy arctic ice near this place, and I should like if Mr. Schei could tell us if he could estimate the thickness of that ice, because I have a shrewd suspicion that it was our old friend—or old enemy—of 1876, to which we gave the name of palæocrystic, on account of its very massive character. In conclusion, I should like, in the name of the officers who served under Sir George Nares, to offer to Captain Sverdrup our warmest and sincere congratulations on the great and valuable geographical results he has brought home with him from this expedition.

The PRESIDENT: That wheel was a pedometer for measuring the route, and the ice is about 30 feet thick.

Admiral ALDRICH: I am delighted to add my remarks to those of Admiral Markham in saying how sincerely I congratulate Captain Sverdrup on the success of his expedition, and not only Captain Sverdrup but all those who went with him. I think Admiral Markham has pretty well thrashed out all the points. Up here we all noticed the presence of that wheel, and the pedometer must have been a useful thing on smooth ice. I can only wish that Captain Sverdrup had completed the gap between his exploration and the one which I made under Sir George Nares. It is a very little gap, and apparently on the map it is a very simple thing to do, but I have no doubt that along that coast some of that ice which Admiral Markham calls our enemy would be met with. It is just thereabout one would expect to find it, although I think, so far as I can remember, the ice along the coast was not so heavy as it was in the neighbourhood of the north end of Smith sound; yet, as Captain Sverdrup thinks—and I think he has good reason for stating what he thinks—there is no land to the north of where he was, we may assume that for some reason or another there must be something to prevent the formation of the heavy ice on that part of the coast. One can scarcely see why it should not be along the north-west coast. That remains among other interesting items to be discovered in the future. Whether any one will ever deem it worth while to go out and look I know not, but I firmly believe in my own mind that we were put on this Earth's surface to discover as much as we can about it. And all I can say in regard to those who began and those who have continued and those who may in the future continue is, that one wishes that the same success may attend their endeavours as has attended Captain Sverdrup and his followers.

The PRESIDENT: Is there any one present who would address us on the geology of these regions?

Prof. GARWOOD: In the absence of anybody worthier, I feel it my duty to express the very great admiration I feel for the excellent work which has been done by Mr. Schei and his companions with regard to the scientific portion of the expedition, especially with regard to the geology. At this meeting I cannot go into details about what we have heard, and we have been told that only a portion of the details have been worked out. There are, however, one or two points to which I should like to allude. It is very interesting to me to hear that the geological formations mapped by Mr. Schei are very similar to those which occur in the island of Spitsbergen, and I can appreciate very much the very difficult work Mr. Schei must have had in order to collect this material. After the two holiday trips I made with Sir Martin Conway, which we made in the summer, I can appreciate the difficulties of obtaining collections of this kind. With regard to the details, there are one or two points I would like to call your attention to—one is the enormous widespread occurrence of marine rocks of upper carboniferous age. I did not quite gather whether these rocks are what are spoken of as Permo-Carboniferous, or whether they are the true carboniferous rocks of this country. On the east side of North America the former rocks do not occur, but from Spitsbergen spread right away into Russia and that part of the world. So that now we have evidence of an upper carboniferous sea occupying the present site of the Arctic ocean. Then with regard to old red sandstone formations, those occur right across from Spitsbergen, and the author mentioned many other forms and fossils of alpine marine trias with *Damella cornelli* quite different to the rocks of our own country, again proving an arctic sea at that period also. With regard to raised beaches, it is interesting to find that that part of the country shows changes of level, just like the island of Spitsbergen, Franz Josef Land, and other portions of the far north. In that connection the absence of a more extensive glaciation in the past is very interesting indeed. We have heard a great deal lately about the cause of these raised beaches. We have been told that the raised beaches are due to the melting away of the former ice-sheet which stretched further to the south than it does at the present day. Now that appears to be quite contrary to the recent observations made by the author. If the ice is now at its maximum, how do we account for the raised beaches? That is an interesting point I should be glad to hear something more about. There are many other minor details which we cannot enter into at this early stage, but I should like again to congratulate Mr. Schei on the very important work done by himself and companions in these regions.

The PRESIDENT: I have no doubt Prof. Garwood regrets the want of time in discussing these questions. The whole subject of the northern archipelago is one of deepest interest. It is a homogeneous region in itself, geologically, meteorologically, and geographically, and if Captain Sverdrup could have remained here a little longer we might have had another and fuller discussion on the whole subject of the geography of these regions. I hope that may be possible at some future time. We now have to thank the authors of the papers. It is a very great pleasure, I am sure, to the people of this country that they should be colleagues, as it were, in arctic discovery with our gallant Norwegian kinsmen. The Norsemen were the first arctic explorers on the east and west of Greenland. There are those who believe, as I am inclined to do, that the great cairns discovered on Washington Irving Island are not wholly unconnected with the discoveries of the Norsemen. If that is the case, we must feel that Captain Sverdrup and his companions, when near that island in Hayes sound, were on their own land. I do not venture to say that the round towers mentioned up Jones sound had anything to do with the Normans; but I do feel that we may rejoice in finding that the Norwegian explorers have filled up this gap which we have long wished to have filled up,

more than if it had been filled by explorers from any other country. I rejoice to see those names which we used to study in the old maps now appearing as a sort of wedge between our eastern and western discoveries. It is pleasant to read these old Norse names, for the most part, I think, describing the character of the country or of the cape or the bay, instead of covering the whole map with Jones and Brown and Robinson. I was very much struck, particularly on this point, that Captain Sverdrup has suggested such excellent names, describing the character of the country and the capes and bays. Captain Sverdrup and his companions have set quite an example in the admirable way in which they have conducted their work, and the friendly tone that has existed throughout the expedition, and the way one has helped the other, and this, no doubt, is one of the reasons of their great success. I am sure now the meeting will wish me, by a unanimous vote, to express our warm thanks to Captain Sverdrup for his admirable paper and to the beautiful illustrations, and to Mr. Schei for his most interesting account of the geology of the expedition.

ADMIRALTY SURVEYS DURING THE YEAR 1902.

Under the orders of the Lords Commissioners of the Admiralty, eight of His Majesty's vessels, with three small hired steam-vessels, manned by 78 officers and 703 men, have been employed on hydrographical surveys on the home and foreign stations.

The following is a brief summary of the work accomplished, as detailed in the report prepared for presentation to Parliament:—

Reports of 318 rocks and shoals which were dangerous to navigation have been received at the Hydrographic Department, and were notified to the public by Notices to Mariners; 1924 miles of coast have been charted, and an area of 12,661 miles has been sounded.

In *Great Britain*, various resurveys were made—at Portsmouth and Plymouth; in Dover bay, and in the Thames estuary.

The river Yealm was surveyed, and a plan made of Wembury bay.

King road, Bristol channel, was resounded. Great changes have taken place here since the last surveys in 1880.

Loch Roag, a very fine harbour in Lewis, was resurveyed, revealing a great many new rocks.

A remarkable instance of a local magnetic focus was also found in East Loch Roag, where the compass is much deflected.

A survey of Moray firth was carried as far as Burgh head, on a scale of 4 inches to the mile.

Kingstown harbour was resounded, and considerable changes found.

In *Newfoundland*, the survey of the intricate bay of Exploits was continued, and a plan of Peter arm was also made.

In the *China seas*, two ships were at work. The surveys of the East Lamma channel and the western approach to Hong-Kong were finished.

Mirs bay survey was continued, while plans were made of Long and Crooked harbours; and the outer part of Tolo channel, left incomplete last year, was also finished.

A considerable part of the north coast of the British sphere of influence around Wei hai wei was charted, and an area of the Yellow sea was sounded.

A complete survey of the Peiho river entrance and Taku bar was made, for the purpose of planning works for the improvement of the bar.

A part of the approach to Amoy was examined, and several rocky heads discovered.

In *Australasia*, the surveys of Poverty bay and the Bay of Plenty, New Zealand, were proceeded with. A survey of Gisborne anchorage was also made.

Bramble cove, Tasmania, was charted on a scale of 6 inches to the mile.

In the Solomon islands, a running survey was made of Ysabel island, recently transferred to Great Britain by Germany, and quite unknown; plans were also made of Vulavu, Turnibilli, Maringe, and Estrella anchorages, in the same island. Extensive banks were found on the eastern side of Ysabel.

At Gavutu, a plan was made of Tulagi island, the residence of the commissioner.

In all communications with the natives of Ysabel, they were found quiet and peaceable. The Solomon islanders do not generally bear this character, but a surveying vessel, not desiring to obtain anything from the natives, raises no suspicions, forms an excellent means of opening relations with them, and tends to friendly terms being maintained.

In *British Columbia*, the main triangulation of the Vancouver island surveys was extended to Cape Commerell and Cape Caution.

Soundings over an area of 288 square miles were obtained in the approaches to the strait of Juan de Fuca.

The survey of the inner channels of Haro strait from Sydney to Active pass was completed.

Broughton strait survey was finished.

Beaver harbour was surveyed on a scale of 4 inches to the mile. While in Queen Charlotte sound a plan was finished of Narwhitti bar.

In the *Mediterranean*, the chart of Gibraltar was brought up to date, and a survey made of the east side of the rock.

A chart was made of the Gulf of Kolokithia in Greece, embracing the coast from Cape Matapan to a point a few miles short of Cape Malea, including the Cervi channel and both shores of Cerigo island as far south as the Dragonera islets.

Plans were also made of Gythion, Port Scutari, and Port Kaio.

On the *West Coast of Africa*, the survey of Old Calabar river was in progress.

The surveying ships maintained by the Indian Government made some surveys in the Persian gulf and a chart of the Chittagong river.

In Bengal, Megna river was surveyed. The Tenasserim coast was charted from Moulmein to Ye river, and on the Arakan coast a harbour known as Cox's Bazaar was surveyed.

During 1902 the Hydrographic Department has published 96 charts and plans, and 38 new plans have been added to the existing plates.

The number of charts printed to meet demands has, during the year, amounted to 522,688.

REVIEWS.

EUROPE.

Old London.

'London before the Conquest.' By W. R. Lethaby. London: Macmillan. 1902.

In spite of the profusion of existing literature on the antiquities of London, there has hitherto been no one work which has attempted to give a comprehensive general sketch of the topography and buildings of the city in its early years. This Mr. Lethaby supplies in the present volume, which is to be welcomed as presenting to the lay reader a clear summary of the results of antiquarian research, many of

which are widely scattered in the proceedings of learned bodies. The work, however, is more than a mere summary, for the author has views of his own on many disputed points, and endeavours to eliminate the mistaken views which, he holds, have gained ground of late years. Many of the conclusions of Mr. J. R. Green and Mr. Loftie are in particular criticized as quite devoid of foundation. As a rule, the author's ideas are sensible and in accordance with the balance of evidence, though the scantiness of this occasionally makes any conclusion little more than a matter of personal conviction. The style is sometimes rather fragmentary, rendering it not always easy to follow the drift of the writer's argument, but the book is none the less a useful contribution to our knowledge of London before the Conquest.

Mr. Lethaby begins with a brief discussion of the origin of London and its fortunes under the Romans and Saxons, and then treats in turn of its main topographical features—hydrography, roads and streets, walls, churches, etc. A few only of his conclusions can here be touched upon. He is throughout a consistent advocate of the antiquity, whether of the city itself or of its main features, many of which, he thinks, show a continuity of existence from very early times. He holds that London existed before the Roman occupation, and that the legends related by Geoffrey of Monmouth were based on real folk-lore, and were not pure inventions. The derivation of the name from a King Lud, though in accordance with tradition, cannot, however, be accepted without further evidence. He believes in the existence of a Christian Church in London in British days, and places the occupation by the Saxons about 570. With regard to the lines of communication, he dismisses the idea of a ford at Westminster as a pure myth, showing that the memory of the former ferry at this part survives in Horseferry Road. The great north and south Erming Street, not referred to in the Antonine Itinerary, was, he concludes, the work of late Roman times. The west to east road, which followed the present course of Oxford Street, passed through the City and by the Mile End Road through Stratford, and did not, as has been held, take a more northerly course by Old Street. The original London Bridge was but little to the east of the existing structure, and its continuation north coincided exactly with the modern Gracechurch Street. Much interesting information is also given respecting the citadel, the quays, the churches, "London Stone," and many other details into which limits of space forbid us to enter.

Europe in the Sixteenth Century.

'Shakespeare's Europe. Unpublished Chapters of Fynes Moryson's Itinerary.' By Charles Hughes. London: Sherratt and Hughes. 1903.

The well-known 'Itinerary' of Fynes Moryson, in which that acute observer set down the personal narrative of his travels through the greater part of Europe, does not represent the whole literary activity of its writer. After the publication of the Itinerary in 1617, Moryson set to work on a more systematic account of the various European countries, which was to set forth in outline the history, existing state, religion, manners and customs, etc., of the several states. The work seems to have been completed by 1619 or 1620; but though its author obtained the licence for its publication in 1626 from the then head of the State Paper Office, Sir Thomas Wilson, he for some reason or other never carried out his intention, and the work has remained in manuscript to the present day. At an unknown date it became the property of Corpus Christi College, Oxford, where it was lately examined by Mr. Charles Hughes, its present editor, who has done good service by making generally accessible such an interesting memorial of the state of Europe at the close of the sixteenth century. The manuscript is in three handwritings,

one being that of Moryson himself, the others those of assistants. Its substance is somewhat unequal in character, being in part made up of Moryson's own observations, in part a compilation. In view of the great length of the manuscript, which would, if printed in full, have occupied some 1200 pages, Mr. Hughes has probably exercised a wise discretion in omitting much of the compiled information, the value of the work lying principally in the shrewd personal observations of the writer on the men and manners of his time, in which respect the insight given is extremely valuable, if not unique. The careful account of Germany as it was in Moryson's day is perhaps the most valuable section, but the survey practically includes the whole of Europe, except Spain and Russia. The editor is careful to indicate where omissions occur, and his brief outlines of the subjects of the omitted sections will be useful to those who may be inclined to go to the original for further information. The work is produced in excellent style, and contains a sketch of Moryson's career, as well as photographic reproductions of pages of the Itinerary and its supplement.

ASIA.

French Indo-China.

'Mission Pavie, Indo-Chine, 1879–1895. Géographie et Voyages, IV. Voyages au Centre de l'Annam et du Laos, et dans les régions sauvages de l'est de l'Indo-Chine.' Par le Capitaine de Malglaive et par le Capitaine Rivière. Ditto, V. 'Voyage dans le Haut Laos et sur les Frontières de Chine et de Birmanie.' Par Pierre Lefèvre-Pontalis. Paris: Leroux. 1902.

The monumental work which records the results of the untiring labours of M. Pavie and his coadjutors for the elucidation of the geography and ethnology of French Indo-China is brought a stage nearer completion by the issue of these two volumes, which contain the reports of three of the officers on M. Pavie's staff, each preceded by an introduction from the hand of their chief. As was the case with former volumes, they embody a large amount of valuable material on some of the least-known parts of the Indo-Chinese peninsula, and are interspersed with carefully compiled maps, which will form an indispensable basis for the mapping of these countries. The report of Captain de Malglaive, which occupies the greater part of vol. iv. of the work, describes an important series of explorations carried out in 1890 and 1891, mainly with the object of elucidating the best lines of communication between the coast of Central Annam and the Mekong, across the difficult country of mountains and plateaus partly explored in the seventies by M. Harmand. During these journeys, the main results of which are summarized by M. Pavie on p. xxiii. of his introduction, he had five times crossed the water-parting, four times carried a line of survey between the Mekong and the ocean, and discovered the ideal route into the heart of the country by the passage of Ai-Lao. His work also threw new light on the ethnographic relations of this region. The last part of the same volume is occupied by brief reports by Captain Rivière, an officer of much promise, who unfortunately succumbed to the effects of the climate before completing his work, so that the complete memoirs which he would otherwise have prepared are not available. In 1890-1891, Captain Rivière had done good work in the upper Mekong basin, especially in the Tran-ninh district, south-east of Luang Prabang, and in 1894 he was attached to the mission for the examination of the upper Mekong region in conjunction with the English party under Sir J. G. Scott. He was a careful observer, and during the course of this expedition, on which he contracted his fatal illness, he had made some important astronomical determinations of position, while throughout his journeys he took many excellent photographs, which have been used to illustrate the various volumes of the series.

The fifth volume of the geographical memoirs is occupied by the reports of M. Lefèvre-Pontalis, a young civilian attached to the "Ministère des Affaires l'étrangères," who, when a student at the "École des Langues Orientales," had already been attracted to the study of French Indo-China by a chance meeting with M. Pavie. Eventually appointed to the staff of the mission, he was for a time personally attached to M. Pavie himself, keeping the record of his journeys and closely associated in all his work. He was afterwards entrusted with independent work, for which his enthusiastic study of the geography of French Indo-China had pre-eminently fitted him, and the results of his labours, which include important observations on the populations and economic possibilities of the regions traversed, are given in the present volume. His earlier journeys were principally concerned, like those of Captain Rivière, with the upper Laos region, while, like that officer, he took part in the Anglo-French frontier commission of 1894, exploring the middle valley of the Nam Hu in conjunction with Lieut. Thomassin and Dr. Lefèvre.

AFRICA.

Map of the Marchand Expedition across Africa.

'Mission Marchand. Haut-Oubangui—Bahr el Ghazel—Nil-Ethiopie-Djibouti Carte publiée sous les auspices de la Société de Géographie de Paris. Dressée et dessinée par le Commandant Baratier d'après les travaux topographiques et astronomiques des Officiers de la Mission Marchand et d'après les itineraires des Officiers du Haut-Oubangui, de M. Faivre (Expédition du Dedjaz Thessama), de la Mission Bonchamps, de la Mission Bòttego, et des anciens 'voyageurs.' Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. 4 sheets. Paris: Henry Barrère. 1903.

All the maps, showing the route of Commandant Marchand's expedition across Africa, that have appeared so far have been mere sketches, and a final map, giving the complete geographical results of the journey, has, for some reason, been delayed longer than might have been anticipated. However, we have at last, published under the auspices of the Société de Géographie of Paris, the complete map of the expedition, combined with the work of other explorers. This consists of four sheets, each measuring about $3 \times 2\frac{1}{4}$ feet, and is drawn on the scale of 1 : 1,000,000. It includes all the more important part of the journey from the Ubangi river through the Bahr-el-Ghazal region to the White Nile, thence east through Abyssinia *viâ* Addis Ababa and Harrar to Jibuti. In addition to the route of the Marchand expedition, an attempt has been made to show the routes and geographical results of other explorers through the same region, and those of the Bonchamps, Faivre, and Bòttego missions are laid down, as well as recent explorations of French officers in the upper Ubangi. But the map cannot be taken as representing the present state of our knowledge of this part of Africa, for in several districts it is surprisingly incomplete and out of date, and districts which are now fairly well known are shown as almost unexplored. For instance, in the region to the north-east of Lake Stefanie and the chain of lakes as far as Lake Zwai and the upper valley of the Hawash, the important work by a most competent surveyor who accompanied Mr. J. J. Harrison's expeditions in 1899–1900 seems to have been entirely overlooked, as well as that of other explorers in the same district. Then, again, the surveys of the expedition under Major Austin from the Sobat to Lake Rudolf have not been utilized, and the country through which he passed from the upper Akobo to the north-west end of the lake is shown as unexplored, although it is clearly laid down in the map published in the *Geographical Journal* for June, 1902. Major Gwynn's careful survey work has also been apparently overlooked. Other similar cases

might be pointed out, and it is to be regretted that better use was not made of the available cartographical material for this region.

As regards the route of the Marchand expedition, in many parts the country traversed was more or less known before, but a great deal of detailed information has been added, and positions of places which were only approximately laid down have been more accurately determined. It would have been a great advantage, and saved further trouble and consulting reports, if a table giving particulars of the astronomical observations taken had been printed upon the map itself, for which there is ample space. The position of some important places as determined by the Marchand expedition differs from those hitherto accepted. For instance, Fashoda is moved in longitude about twenty-three minutes to the west of the position laid down on the War Office map as the result of careful observations, and which certainly cannot be in error by anything like this amount. Other places, which have been fairly accurately fixed for some time past, are here altered considerably. The map is clearly printed in colours, and shows the principal routes in red, hills chalked in brown, and water blue. A plan of Fashoda is given as an inset.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

English and Irish Climates.

'The Climates and Baths of Great Britain and Ireland, being the Report of a Committee of the Royal Medical and Chirurgical Society of London.' Vol. i. The Climates of the South of England, and the chief Medicinal Springs of Great Britain. Vol. ii. The Climates of London and of the Central and Northern Portions of England, together with those of Wales and of Ireland. London: Macmillan & Co., Ltd. 1895, 1902.

Unfortunately, these important volumes deal only with the larger part, not the whole, of the British Isles, for, as is stated in the preface to the second volume, "the Climates of Scotland have been omitted, as the committee failed to secure the necessary local co-operation." The necessary local co-operation, however, was obtained elsewhere in full measure, and the various localities are described by the authorities best fitted for the task.

To a considerable extent, the volumes may be looked upon as a manual of medical geography for the southern parts of the British Isles. The standing of the authors secures that there is no "booming" of particular health-resorts, and the statistics of climate, which are compiled mainly from the published summaries of the Royal Meteorological Society, are of great value as a basis of comparison. Besides climate, the subjects dealt with are mainly the mineral wells, water-supply, drainage, and the prevailing diseases of the locality; but some authors go considerably beyond this. Particular reference may be made to Sir John Moore's description of Ireland, which, besides being the longest article in the series (it comprises two hundred pages), is in some ways one of the best geographical accounts of the island with which we are acquainted.

It is natural that different authors should handle the available climatic statistics with varying degrees of skill, and the data themselves vary greatly in their completeness and trustworthiness. The description of South Wales by Dr. Theodore Williams in vol. ii. may be taken as an example of the best way of marshalling the available facts.

Medical men, being trained to careful observation and reasoned deduction, could not fail to notice how much the configuration of a district affects its climate and healthfulness. Examples could be culled from every article, but we are content to quote one from Dr. W. M. Ord's Introductory Remarks on the Climate of the South

of England in vol. i., because it is a general statement, and refers to a comparatively uniform feature—the coast-line.

"As an outcome of this frequent change of substance in the seashore follows the remarkable variety in the outline of the coast already mentioned. This is, indeed, much more than a mere variety of outline; it consists also in rapidly succeeding diversities in the elevation of the projections and recessions, so that in a coast which looks in the main southward a rich series of contrasts of aspect is obtained. Where a ridge comes down from high inland into the sea, its shelving sides are found to embrace great differences of climate within a small area. We may find one side of a bay exposed to east winds, with an air which is found to be tonic and bracing, while on the other side, with a westerly or south-westerly aspect, the sun pours in on a beach lying at the foot of high cliffs with almost tropical warmth; and one side of a headland may be so warm as to be held to be relaxing, while the other is cool and invigorating."

The article on the Climate of London, by Dr. W. Ewart, presents many points of special interest, bearing particularly on the changes in natural conditions due to artificial circumstances. The dryness of the soil under London produced by the constant drawing away of the underground water, and the covering of so large an area of streets with an absolutely impervious paving, is credited with a considerable share in the healthiness of the town. The progressive desiccation of the soil and the increasing stringency of regulations against the emission of smoke are assigned as reasons for the gradual diminution in the number and intensity of the fogs.

It is difficult to give a fair idea of a book which has many of the advantages and defects of an encyclopædia; but that the book is valuable and a credit to the society which has produced it is, we think, made evident by the few instances we have been able to cite.

General Climatology.

'Handbook of Climatology.' By Dr. Julius Hann. Part i. General Climatology. Translated by Robert de Courcy Ward. New York: The Macmillan Company; London: Macmillan & Co., Ltd. 1903.

Hann's 'Climatologie,' in its latest three-volume edition, has taken its place as the acknowledged authority on the subject, and it would be difficult to imagine that the work could be superseded or displaced in the present generation.

In the United States, climatology, which may be called geographical meteorology, is systematically studied in universities and colleges, and Prof. Ward is charged with the subject at Harvard. With the immediate object of supplying his students with a satisfactory text-book and the wider purpose of affording the English-reading public an opportunity of becoming acquainted with Hann's work, he resolved to make the translation which is now before us. Any one who glances at the pages crammed with statistics of the second part of the original book, Special Climatology, will understand why Prof. Ward resolved to limit his labours to the translation of Part i., General Climatology. This part makes a very substantial volume, and it is admirably translated; the only real improvement that we could suggest would be a liberal supply of diagrammatic illustrations. Prof. Ward has brought the divisions and subdivisions of the text into a form which appeals more to the English reader than that which is adopted in the original, and there are certain additions, chiefly in the way of American instances, which counterbalance certain omissions of Central European details.

While in general the references to recent publications are copious and up to date, we miss Dr. Herbertson's important paper on the distribution of rainfall over the land, which is certainly a contribution to climatology as distinct from

meteorology. We should have liked—and we say it even at the risk of being considered insular—a somewhat fuller citation of illustrative instances from our British climates; for, like our weather, they comprise a considerable range of samples.

The book has been very carefully revised, and we have noticed remarkably few slips; perhaps the most serious is the ominous inclusion of Peking in a table headed "Evaporation and Rainfall *in Russia*." The curious spelling *Enisseysk* occurs in one place, although *Yeniseisk* is given elsewhere. To take yet another example from Russia, we find *Kaschkar* decidedly unfamiliar; it is obviously intended for *Kashgar*. Since, however, the book deals, not with special climates, but merely with the general principles of climatology, uniformity in transliteration is not of essential importance.

The book is divided into two parts—(i.) The Climatic Factors, such as temperature, moisture, wind; (ii.) Solar Climate and the chief varieties of Physical Climate, which in turn is subdivided into three sections. There are—(1) Solar or Mathematic Climate, *i.e.* the theoretical climate zones of a sphere with homogeneous surface; (2) Physical Climate, including continental, marine, and mountain climates, the last being dealt with in a particularly full and interesting way; and (3) Changes of Climate. The last section discourses of the geological and secular changes of climate which have unquestionably occurred, and it also deals with periodic changes. Sunspot and lunar cycles of climatic change are neither strongly affirmed nor wholly denied, but on the whole the various theories are branded with "faint praise." Brückner's cycle of thirty-five years is more cordially received because it has been inductively arrived at from climatic facts, while most of the others have been deduced from the laws affecting the assumed controlling causes.

The metric system and Centigrade scale are used throughout, and very full reduction tables are supplied for their conversion to our more familiar units. We note with some surprise that the translator has thought it necessary to give Fahrenheit equivalents to one-hundredth of a degree when the Centigrade values are only to one-tenth. As a tenth of a degree Fahrenheit has practically no meteorological and still less climatological importance, the nearest tenth would certainly have left an ample margin of safety.

Prof. Ward deserves the hearty thanks of geographers, as well as of meteorologists, for placing this invaluable treatise in the hands of English-speaking students. H. R. M.

GENERAL.

Encyclopædia Britannica.

'The New Volumes of the Encyclopædia Britannica.' 9 vols. text, index vol., and vol. of maps. London: A. & C. Black, and the *Times*. 1902–1903.

The supplement to the 9th edition of the Encyclopædia Britannica, brought out under the auspices of the *Times*, is now complete, and it may be of interest to glance briefly at those portions of the work which deal with geography and allied subjects. A casual inspection of the volumes is sufficient to show that among the many branches of knowledge of which the latest developments are here discussed and summarized, a decidedly large proportion has a bearing on geography in one or other of its aspects. Not only are the original articles of the 9th edition supplemented by a statement of the changes which have taken place during the last quarter of a century, but many places are to be met with in the alphabetical arrangement, which were not treated of at all, independently, in the former work.

As regards the general method adopted, it was no doubt impossible, in a work of such magnitude, in which so many different writers have taken part, to secure complete uniformity, the special character of the work as an annex to an older publication rendering it particularly difficult to adhere to a definite plan throughout. Thus, while some of the writers have held to the original intention of making the new material merely complementary to the old, others have worked on more independent lines, with the result that their articles possess greater unity, though at the cost of a certain amount of repetition of the information already given in the 9th edition.

Differences in the treatment of the several subjects naturally arise from other reasons. In the case of the older and more settled countries, the chief attention is necessarily devoted rather to the recent political developments and changes in statistical data, than to more purely geographical aspects, except in the cases where the writer of the article, by his recognized standing as a geographer, has been competent to construct his work on the scientific basis demanded by modern geographical notions. The rarity of such cases, of which the most striking examples are perhaps Prof. Davis's admirable treatment of the geography of the United States and North America, the late Dr. George Dawson's of Canada, and Prince Kropotkin's of the various divisions of Russian Asia, brings out once more the imperfect training which even our recognized authorities possess in the principles of scientific, physical, geography, which ought properly to underly a right understanding of the human side of the subject. It is under the more recently developed branches of physical geography—oceanography, limnology, seismology, and the like—hardly recognized as independent subjects of study when the 9th edition appeared, that we find some of the articles of most scientific value. The first two are admirably treated from a general point of view by Dr. H. R. Mill, the third by Prof. Milne; while Mr. H. N. Dickson's series of articles on the individual oceans are excellent summaries of the results of recent research in each. Dr. Mill's article under the heading "Geography," which contains a useful sketch of the development of geographical theory as well as of the course of modern discovery, should also be mentioned here, as well as those describing such special physical features as the Alps (from the competent pen of Prof. Bonney), the Pyrenees, and the Himalayas.

The volumes contain, however, a vast amount of valuable information on the descriptive and statistical sides of the subject, especially as regards those continents and countries which have been first brought into special prominence within the last twenty-five years. The various portions of the British Empire are very fully dealt with, in many cases by men who have themselves taken part in the important events of which they have recently been the theatre. Sir Thomas Holdich, Sir Harry Johnston, Sir Frederick Lugard, and Sir J. G. Scott are only a few of the writers who come under this category. Africa, in its general, physical, ethnological, political, and economic aspects is the subject of an article which runs to thirty-eight pages, and its major physical features are described under their individual headings; while the recent advance in the survey and exploration of Asia, South America, and the Polar Regions is also dealt with fully. Of special countries on which attention has been focussed of late, Egypt is perhaps as thoroughly treated as any, the article (by various contributors), in which is recorded the striking advance made by that country under British tutelage, running to no less than thirty-three pages.

The articles dealing with the countries of Europe are, as already remarked, largely statistical in character, but their value in a work of reference by no means suffers from this, and, being all written by competent authorities, may be taken

as thoroughly trustworthy at the time of writing, though owing to delay in publication some of the facts have since become out of date. In some cases (*e.g.* in that of Bulgaria, to which fourteen pages are devoted) the physical geography meets with more attention than in most, though, as before remarked, this is certainly not, broadly speaking, the strong side of the geographical articles. Lastly, mention should be made of the excellent index, which embraces the original as well as the supplementary volumes, and though a marvel of compression, does not suffer from this from the point of view of practical utility.

In the editions of the work previous to the supplement excellent maps by British cartographers were published with the articles themselves, and for purposes of handy reference this was certainly a convenient arrangement; but the publishers have now issued, as one of the new supplementary volumes, a general atlas, of 124 maps, and an index to about 250,000 place-names, constituting volume xxxiv. of the complete work. Many of the maps contain a great deal of information, and are especially full of names of places—a useful feature, while the copious index is most serviceable.

The maps in this atlas are of American origin, being published by the American Century Co. Out of a total number of 124, which the atlas contains, 52 are devoted to the United States, 13 to the British Isles, and fewer to some of the important continental countries.

The maps are printed in colours: hills brown, seas blue, railway lines red. Other colours are employed to show boundaries. The hill shading, which is in vertical hachures, is often very confused, and on some of the maps the confusion is considerably increased by place-names, which are often not only overcrowded, but badly written and awkwardly spaced. There are some remarkable instances of the lack of proper supervision in the spelling of place-names, such as that of Sheringham in Norfolk, which is given both as "Sheringham" and "Sherington" on one map, and "Sherringham" on another. The registration of the various colour stones is often unsatisfactory, and in some cases, such as that of the map of Northern India (No. 41), this leads to confusion both in boundaries and railways. No. 3 is a useful travel map of Central Europe, although on a small scale, and shows railways, steamship lines, and Alpine roads; but such an important route as that to the Hook of Holland from Harwich is not indicated.

On several of the maps red spots appear, and a note explains that these indicate "volcanoes active during the nineteenth century;" but in the map of Central Africa, the only really active volcano in that continent is not indicated. On the same map, the Uganda railway is shown as passing far to the north of the line it actually takes on approaching Victoria Nyanza. This northerly route, although originally surveyed, was subsequently changed to the southerly and shorter one. As might be expected, the maps of the United States are the most useful and satisfactory, being drawn on fairly large scales, and containing a large amount of information. It should be stated that in some cases the atlas is supplemented by black and white maps in the text.

THE MONTHLY RECORD.

EUROPE.

The Age of the Swiss Lake-basins.—At the meeting of the Geological Society of London on April 29 of the present year, Dr. Preller read a paper on "The Age of the Principal Lake-basins between the Jura and the Alps," being the sequel to a paper read last year, in which the same author had shown that the principal Swiss lake-basins could not have existed during or immediately after the first or Pliocene glaciation of the Alps, but had not dealt with the question of the particular period of their formation. Considering first the case of the Zürich lake-valley, he now shows that the deep-level gravel beds in the Limmat valley near and below Zürich are essentially fluviatile, similar to the gravel carried by the river Sihl at the present day. They rest upon glacial clay of the second glaciation, and are overlaid by the moraine bars and secondary products of the third glaciation, which are in turn overlaid by, and mixed with, the post-glacial alluvia of the Sihl. The author therefore holds that they were deposited by a river during the second inter-glacial period; that the lowering of the valley floor was initiated in the course of the third glaciation, probably when the glacier had already reached its maximum extension; that the zonal subsidence continued throughout the retreat of the ice; and that the simultaneous formation of the lake-basin should therefore be assigned to the end of the glacial period, after which the original basin was restricted to its present dimensions by post-glacial alluvia. The same arguments were also shown to apply, in the main, to the origin and age of the other principal zonal lake-basins, the position and depth of which, it is held, point to the probability that the bending took place along several more or less parallel lines within the zone between the Alps and the Jura; that it was by no means of uniform depth; and that the Alps did not therefore subside as a rigid mass, but that the zonal bending along their edge merely extended locally for some distance from the deepest points of the lake-basins along the floors of the principal Alpine river-valleys. In support of the above conclusions, which met with general acceptance in the discussion following the paper, the author also pointed to the difficulty in the way of believing that glaciers could ever fill such extensive basins as those of the principal Alpine lakes.

Settlements on the Lower Moselle.—Dr. W. Ademeit has contributed to the *Forschungen zur deutschen Landes- und Volkskunde*, Bd. 14, Heft 4, an essay on settlements in the country lying on the left bank of the Moselle above Reil, in the Wittlich hollow, and the Trèves valley. He describes the configuration of the district, its geology, climate, and soil, and sketches its general history. The influence of the river as a means of communication in early times is shown by the Keltic place-names, which constitute 65 per cent. of the whole. They occur in great numbers along the river and the lower valleys of its tributaries. The Roman names probably belong to the sixth to eighth centuries, as they are derived from a late form of Latin. Their concentration in the Moselle valley seems to indicate that they are connected with the introduction of viticulture by the Romans. German names are less common, not because the immigrants were few, but because they occupied old Keltic settlements. Those of the earlier period end in *heim* and *ingen*, while those of a later immigration and of various forms are almost confined to the Wittlich hollow, indicating an extension of cultivation. Dr. Ademeit points out that in the Trèves valley the settlements were generally at a distance from the river protected by the terraces from floods. Schweich, situated half a mile from the Moselle, where the alluvium of the river meets the diluvium

of the Wittlich hollow, owes its importance to the road from Trèves to Coblentz, which, after crossing the river, passes through the town. Riol lies on a semi-circular flat which was formerly an island, and, like most other villages occupied in viticulture, was formerly in the possession of a monastery. The peninsulas attracted settlers, not only because their terraces afforded suitable ground for cultivation, but still more because their isolated situation afforded protection. On the right bank, where the mountains fall more steeply to the peninsulas, the villages have all Keltic names except Detzem (*ad decimum lapidem*).

Samland and its Inhabitants.—Dr. R. Jankowsky has treated fully the geography, etc., of this district in a thesis written for the diploma of doctor at the University of Königsberg. Samland has an area of somewhat less than 800 square miles, and is bounded by the Baltic, the Kurisches and Frisches Haff, and the rivers Pregel and Deime. It is a land of ground moraines, and owes its form to the glacial period. The higher summits, however, are built up of northern sand. Erratic blocks are scattered about in large numbers, especially in the western part. The depth of the diluvial covering is very variable, being thinnest in the hilly north-west, where the brooks have in some places cut their way down to the underlying Tertiary deposits. These, too, have been raised as high as 65 feet above sea-level, and even the lower beds, among them the blue earth containing amber, rise in some points above the water. East Samland has a slight fall, and the defective drainage has needed artificial regulation. The west coast is high, and between Brüsterort and the mouth of the Pregel extends the only continuous elevation, the Alkgebirge, which culminates in the Galtgruben at a height of 330 feet. The Prussians, closely allied to the Lithuanians and Letts, drove out the German inhabitants during the great migrations before the present era, but in the fourteenth century Prussians and Germans were about equally numerous in Samland. In later times immigrants from Great Britain, France, and other countries flocked to Samland, and in 1706 was founded in Königsberg the "Brüderschaft hochlöblicher Grossbritannischer Nation," which existed till 1800. Now all differences of nationality have disappeared. Sixty-five per cent. of the inhabitants are engaged in agriculture, growing cereals, beet-root, and fruit, and a large part of the land is laid down with grass. Fishing affords occupation to many, especially in the Haffs, where fish are plentiful; and the collection of amber from the Haffs and a mine near Sassau has during the past twenty-five years yielded about £37,500 annually to the revenue. Königsberg, on the Pregel, and the junction of thirteen lines of railway, is an important strategical point as well as a commercial centre. Its most flourishing period was 1873–78, when the most important lines into Russia had been opened, and before the export of corn from the Russian ports was fostered by preferential tariffs.

The North-eastern Moorlands of Mecklenburg.—Dr. A. Kaestner has fully investigated the Rostock, Gelbensand and Ribnitz heaths and Fischland, covering an area of about 33,000 acres near the coast of Mecklenburg. The surface of this district, with the exception of small isolated areas of boulder clay, is covered with sand, which was laid down in a lake when the inland ice was melting away. The thickness of the sand varies from 22 to 23 feet. It stands highest in the south-east, and thence falls more or less regularly to the coast, where it partly sinks under the surface of the sea, and it fills a shallow hollow in the boulder clay which underlies it in all parts. The margins of the sand region have also a regular fall from the south-western corner, and the stones strewn along them are bank deposits of a lake of glacier water. This fall may be explained by an unequal sinking of the coast region. The total absence of terraces indicates that the Mecklenburg-Pommeranian lake did not retire backwards. The sand of the

north-western heath of Mecklenburg differs from that of the south-western in being of finer grain, but its proportion of heavy minerals with a specific gravity of over 2·872 (s. g. of dolomite) is about the same. Dunes are less extensive than in the south-west.—*Mitt. aus der Grossherz. Mecklenburg. geol. Landesanstalt*, xiii.

The Austrian Peat-moors.—An interesting account of the peat-moors of Austria is given by Dr. W. Bersch in the *Deutsche Rundschau für Geographie* (February, 1903). The writer begins by discussing the conditions necessary for the growth of peat—the presence of the special plants of which it is composed, of a suitable sub-soil, and of water, which prevents decomposition by screening the plants from the action of the air. Climate also has to be reckoned with, in so far as peat is only a product of temperate regions. According to minor variations in the conditions, the moors are divided into two main classes, high-level and low-level moors, these terms expressing not so much difference in absolute altitude, as of altitude relatively to the water-stratum. Dr. Bersch laments the absence of precise knowledge with respect to the peat-moors of Austria, which, except in Salzburg and Bohemia, have not been studied as they deserve to be, considering their economic importance. The country may, however, be put down as well provided with them, as they are widely distributed through the several provinces. In Vorarlberg and Tirol they are well represented, largely in the form of low-level moors, which in places, especially in the Adige valley, lend themselves well to exploitation for agricultural purposes, though the abundance of mineral ingredients renders the peat less suitable for fuel. In the other Alpine provinces high-level moors predominate, Salzburg showing a particularly large area, and doing much to exploit the moors both for fuel and peat-litter. Carinthia possesses the largest continuous moor in that of Laibach, which might be turned into good pasture-land, were not the inhabitants too poor to take the necessary steps to check the periodic floods. Bohemia, the moors of which have been the object of thorough investigation by Prof. Sitensky, is reckoned to possess an area of from 25,000 to 30,000 hectares of moorland. The well-known watering-places of Bohemia owe their existence to the abundance of mineral constituents in the moors. Galicia, with its network of rivers traversing an extensive plain, is formed by nature to be a moor-land country, but more has been done here than in any other part of the empire to develop the moors in an agricultural direction, the methods adopted being thoroughly scientific and systematic. The abundance of poor and sandy soils in Galicia has been of some influence in directing attention to the utilization of the moors.

The Lakes of the Hohe Tatra.—The Hohe Tatra is remarkable for the number of its high-level lakes; no less than one hundred and seven are found between the elevations of 4000 and 7000 feet. The best known of the small lakes is the "Meerauge," the possession of which has recently been a subject of controversy between Austria (Galicia) and Hungary. According to Prof. Partsch, about half the lakes are true rock basins in the upper parts of the valleys; a number of others are morainic lakes. Their formation corresponds to the time of the ice-period glaciation of the Tatra. Grissinger's work in the Hohe Tatra (*Geo. Jour.*, Sept. 1893, pp. 255–258) included only isolated observations of depths and temperatures in the lakes: the new survey of the group by the Militärgeographische Institute in Vienna, employing photo-grammetric methods in the mountains, shows the positions and outlines of all the lakes on the large-scale map (1:25,000). Dr. Wilhelm Halbfass is about to carry out a systematic investigation of the lakes during this summer. The forms of their basins will be ascertained by a close network of soundings, and all the observations approved in modern limnology will be made. As the lakes are often enclosed on three sides by rock walls, with one

side open and exposed in different directions, exceptional opportunities will be afforded for discussing the influence of mountain "shading" on temperature and fauna.

ASIA.

The Great Wall of China.—Mr. C. E. D. Black, who, when in China, examined personally a section of the Great Wall to the north of Shan-hai-kwan, contributes to the January number of the *Calcutta Review* a description of the wall (preceded by some notes on its history), based on the accounts of the various travellers who have touched it at some point or other of its lengthy course. It is useful to have the available information thus brought together, as few travellers have done more than describe the portion known to themselves personally, and the accounts are therefore somewhat fragmentary. Mr. Black, who, like other travellers, has found much to impress the imagination in the Great Wall even as it exists at the present day, considers that its practical utility in the days in which it was constructed has been unduly depreciated by some writers.

New Vegetation on Krakatao.—In *Nature* of March 26 last, Mr. W. Botting Hemsley gave a short note, based on an article by Dr. Penzig in the *Annales du Jardin Botanique de Buitenzorg*, on the vegetation which has sprung up on Krakatao since the great eruption of 1883. The beginnings of a new vegetation were visible at the time of the visit of Dr. Treub, some three years after the eruption, when the surface of the pumice-stone, lava, and ash was found to be covered with a slimy layer formed by microscopic *algæ*, which, by their decomposing action, created a suitable substratum for ferns, of which a dozen species were already abundant; while a few individuals of fifteen species of flowering plants, most of which had sprung from drift-seeds, were also observed. Dr. Penzig's paper gives the results of the investigations of a party of botanists who visited the island in 1897. They show that sixty-two species of vascular plants were then observed on Krakatao and the two neighbouring islets, no fewer than fifty being flowering plants. Of the latter, the seeds of 7·54 per cent. were possibly carried by birds, 32·07 per cent. were probably wind-borne, and 60·39 per cent. were almost certainly cast up by the sea-waves. Strangely enough, no additional species of fern seems to have established itself between 1886 and 1897. The strand belt is naturally the most abundant in species, and, after passing this, dense thickets of Phragmites, Saccharum and Gymnothrix were encountered, the interior and higher parts being less covered with vegetation, ferns here preponderating. Apart from ferns, the species most probably wind-borne include eight composites, six grasses, and four orchids, one of the last-named being conspicuous and relatively frequent among the flowering plants. As Mr. Hemsley remarks, it is an interesting question how far these facts throw light on the origin of the vegetation of much more remote islands, Krakatao being only 20 miles distant from Java and Sumatra.

AFRICA.

The Anglo-Egyptian Sudan in 1902.—Lord Cromer's recently issued report for 1902, on Egypt and the Sudan, gives, on the whole, a hopeful view of the prospects of the latter, and the progress made towards its development since the overthrow of the Dervishes. On his last (third) visit to the Sudan, Lord Cromer saw reason to think, not only that the country had begun to move, but that it was moving even more rapidly than could have been expected. The prime requisite is the outlay of capital on a large scale, especially for the improvement of the present very defective means of communication; and, though it is not easy at first sight to imagine from whence it can be forthcoming, the hope is expressed

that money in fairly adequate quantities may in course of time be provided by the Egyptian Exchequer, without adding to the taxation at present in force. The first object to which such capital must be devoted is the Suakim-Berber railway, which is regarded as absolutely essential to the well-being of the Sudan. Further developments may be afterwards desirable, especially in the way of improving the means of access to Kassala, El Obeid, and the Ghezireh, or country between the Blue and White Niles. These must take the precedence of any scheme for a railway to Uganda, the necessity or practicability of which has yet to be shown. Telegraphic communication may in time be extended to Gondokoro,* in Uganda territory, though extension in other directions is possibly more required. River transport has already been considerably developed under the direction Mr. Bond, R.N., steamers now communicating monthly with Gondokoro and Meshra-er-Rek (or Wau), with Goz Abu Guma weekly, and with Roseires fortnightly, so long as the Blue Nile is open to navigation. The number of sailing boats south of Khartum is increasing, and a few steamers and steam-barges have been placed on the Blue and White Niles by an English company. Good progress has been made with the surveys under Colonel Talbot's direction, and Mr. Brown has sent in an exhaustive report on the Sudan forests, from which it appears that steps are urgently needed to prevent the forest fires now so prevalent. The prospects of a rubber supply from the southern provinces are good. The possibilities of cotton-growing are dealt with in a separate report, but the construction of the Berber railway must precede any definite measures to this end. Of the individual reports of the Mudirs on their several provinces, that by Colonel Sparkes on the Bahr-el-Ghazal gives valuable information on the present relations of the native tribes, etc. Owing to the constant raids of the Dinkas in the north and the Niam-Niams in the south, the smaller tribes have been broken up, and their country is now an uninhabited wilderness. Those living with the Dinkas (virtually as slaves) are, however, reassembling in the vicinity of the Government posts, and as they are far more useful members of society than the Dinkas, this is an advantage. They supply most of the grain, and all the available carriers, labourers, etc. The Dinkas have accepted the Government as a necessary evil, but the Niam-Niams are well-disposed and progressive. Colonel Sparkes thinks that if they could be induced to become owners of flocks and herds, cannibalism would die out among them. The number of the Dinkas is put down as half a million at most, and that of the smaller tribes at 100,000 all told. Malarial fever is very prevalent, and Europeans are especially liable to the black-water type.

Agriculture in British East Africa.—Mr. A. Whyte, the well-known head of the Botanical Department in the Uganda Protectorate, was lately entrusted with a mission in the coast-lands of British East Africa, with a view to examining and reporting on their agricultural capabilities. His report, handed in in January last, has since been presented to Parliament, and includes a narrative of the journeys undertaken in pursuance of his commission, and a summary of the main conclusions at which he has arrived. They agree in the main with those put forward by Mr. W. A. Fitzgerald in his work on the East African coast-lands, to which reference is made by Mr. Whyte for detailed information on the agricultural experiments so far made. Mr. Whyte regards the coast of East Africa between the Equator and 4½° S. as comparable in many ways to Ceylon, and thinks that this analogy may help to a conclusion as to the agricultural capabilities of the former. The coco-nut palm finds an equally congenial home on the coasts of both countries, and in view of the slight probability of the supply exceeding the demand, he looks forward to

* The most southern Sudanese post, Mongalla, is about 20 miles from Gondokoro.

the creation on the East African coast of a vast forest of palms as productive and profitable as they have proved in Ceylon. Other products, cultivated in conjunction, might pay the expenses of weeding, while, by means of a cheap central tramway, the produce could be conveyed to the various bays, rivers, and lagoons for shipment. Rubber, Mr. Whyte thinks, will rank next as the most suitable and profitable product. The *Landolphia Kirkii* is very generally distributed in the forests, and its growth could be increased to any extent by cultivation; while the large tracts of strong black soil in the back-country seem most suitable for the Central American *Castilloa*, and the flooded tracts on the Sabaki, Tana, and in Witu, for the Para rubber (*Hevea*). The market is very encouraging, and there is no prospect of the supply exceeding, or even keeping pace with, the demand. Lastly, the cultivation of indigo is an industry for which Mr. Whyte anticipates a great future in East Africa.

The Lower Sabi Valley.—Mr. Stanley P. Hyatt, contributions from whom on Eastern Mashonaland and on the Sabi river as a waterway have already appeared in the *Journal*, sends us a further note on the country watered by the lower Sabi, which falls within the sphere of action of the Mozambique Company. The junction of the Lundi and Sabi rivers, on the Anglo-Portuguese frontier, marks, he says, the beginning of a complete change in the nature of the country, the dry and stony bush-veldt of the Rhodesian side giving place to the dense green forest of the Portuguese territory, capable of producing every variety of tropical product. The lower Sabi flows through a comparatively shallow valley, the general characteristics of which continue almost unchanged throughout. In the neighbourhood of the river is a belt of large mimosa thorns, alternating with palm scrub or grass-covered vleis. As the ground rises these give place to Mopani scrub, and this again to a veritable forest, containing much fine timber, and gradually forming an almost impenetrable jungle on the upper slopes of the valley. Some of the trees reach a diameter of 8 or 9 feet, and a clear height of 150 feet without branches. One curious tree consists of a large number of small trunks, which in the course of time merge into a single stem. Near the river the soil is of a black, muddy nature, extremely fertile and easily tilled. This gives place to red sand, and ultimately, in the crest of the ridge, to rich yellow loam. The only rock is grey or bright red sandstone, but this is of rare occurrence. The chief wealth of the Sabi valley consists in the indiarubber creeper, which is indigenous on the north bank, whilst on the south it only requires planting. Cotton is found wild throughout the country. So fertile does the land appear to be that the natives raise crop after crop without impoverishing the ground, the principal grain cultivated being the mpundi, or white Kaffir corn, though much arrowroot is grown, and the castor-oil plant flourishes everywhere. The bulk of the natives are of the Mhlengwi stock, though the chiefs are invariably of true Shangaan (Mchangana) blood. The men have mostly been to work at Johannesburg at some period of their lives, and, being poor in cattle, now pay for their wives in cash—a great incentive to such employment. They are extremely industrious, and their courtesy to the white man forms a refreshing contrast to the insolence and conceit of the natives of the British colonies. Between the Sabi valley and that of the Crocodile is a smaller valley drained by a large sand-river, said to lose itself in a sandy plain some 50 miles from the coast. Its only inhabitants are nomad bushmen of the lowest type, who appear to carry on a relentless war with their neighbours. The Mhlengwi and Shangaans are all armed with the long bow and poisoned arrows, the bow being frequently 7 feet in length, but so stiff that the range is limited. Generally speaking, the Sabi valley is not rich in game, the greater part of the bush being too dense. Elephants are plentiful south of the

river, and the Nyala antelope is constantly heard breaking through the jungle, though seldom seen. There are some buffalo, and consequently some amount of tsetse fly, though this is disappearing.

The Chevalier Expedition to the Sources of the Shari.—The Paris Geographical Society has received a communication from M. Chevalier, dated Ndelle, December 25, 1902, which gives some account of the results of the expedition, and is printed in the May number of *La Géographie*, together with a somewhat later letter to Dr. Hamy sent for communication to the *Académie des Inscriptions et Belles Lettres*, which contributed to the funds of the expedition. The expedition has added much to our knowledge of the country of Dar Banda, in the more restricted sense of the term as applied to the country traversed by the headstreams of the Shari, which has long been a raiding-ground of the Arabs from the north. The eastern part of this region forms the state of the Sultan Mohammed es Snussi ben Abasher, with an area of some 50,000 square kilometres, and its capital at Ndelle, in 8° 25′ 5″ N. The country traversed by the expedition is an immense plateau composed of ferruginous sandstones and conglomerates, with a general altitude of from 1500 to 2000 feet, from the surface of which rocky masses, known as *kagas* in the Banda tongue, rise here and there to an additional height of 150 to 300 feet. They are generally destitute of arborescent vegetation, and are composed of sandstones (either horizontal or inclined), or more frequently of granitic bosses. They have supplied points of refuge from the Arabs for the pagan inhabitants, though some that were formerly inhabited are now abandoned. The valleys of the main streams, and large areas besides, are entirely destitute of inhabitants. The country is badly supplied with water. The most important stream crossed—the Kukuru—was 20 yards wide and 4 feet deep on December 3; the Bamingi was rather smaller, and the Bangoran quite a small stream, while their tributaries are at this time either dry or reduced to an insignificant thread of water. Vegetation is naturally scanty, and the most common trees, which include the *Annogeissus leiocarpus*, "Karite" (*Bassia*), "Nete" (*Parkia*), etc., are all characteristic of the Western Sudan. Curiously enough, the baobab and deleb palm (*Borassus*) seem entirely absent. The arborescent *Acacias*, which characterize the more northern regions, are already frequent, and the gallery vegetation of the more southern streams is not to be seen. M. Chevalier has visited, some 50 miles to the south-east of Ndelle, the apparent meeting-point of the three great basins of the Shari, Congo, and Nile. The Bakaka stream, which flowed hence towards Darfur, falls into the Wadi Kabassa, but it is somewhat uncertain whether this is connected at high water with the Bahr-el-Arab, and so with the Nile, or whether it forms a closed basin. Near the source of the Bakaka is the site of Mbelle, an old Krej city now in ruins situated on the caravan route between Dar Sila (Wadai) and the Ubangi sultanates. The streams in this locality are bordered with rich gallery forests some 100 yards wide, in which a wild coffee shrub producing a berry of excellent flavour was found. M. Chevalier suggests that it may have been from this region that coffee was first imported into Europe. Intelligence was obtained of a large lake on the borders of Darfur, called Mamum by the Arabs (probably representing the Wed Mamum of Potagos), which M. Chevalier hoped to visit. Three pagan tribes—the Karas, Gulla Homer, and Fongoro—dwell on its banks, but the Arabs pasture their flocks there in the dry season. Another new lake is also reported to the west of Lake Iro. M. Chevalier says that the Banda people had its origin on the plateau at the junction of the three great river-basins, in the escarpments of which are caverns, which in the slave-hunting days served as refuges to the Bandas, though their inhabitants are now exterminated.

The French on the Lower Niger.—In accordance with the convention of 1898, the British Government has leased to the French two *enclaves* on the Niger, one at the mouth of the Forcados river, which will be named Toutée, and the other at the foot of the Bussa rapids, which will be called the enclave d'Arenberg. The Bussa rapids extend over a distance of about 60 miles, those of Uru, Patassi, and Garafiri being the most difficult. The flotilla of the lower Niger, under the supervision of Captain Lenfant, has navigated the rapids in all seasons except at the height of the dry season, and as the most practicable channels have been discovered, the task has become less difficult. The cost of carriage to Sorbo Haussa has been reduced to about £28 per ton, whereas by the route Dakar—Kayes—Timbuktu it is more than double. Captain Lenfant believes that the Benue may be advantageously used as a route to the Shari. The Mayo-Kebi, affluent of the Benue, flows from the lacustrine depression of Tomburi, separated from the Shari by marshes some 15 miles in extent, which are flooded in the rainy season. The cost of transport by this route to Lake Chad would, according to Captain Lenfant, not exceed £19 per ton, and the time of transit would be reduced by two months. Sketch-maps of the rapids are published in *La Géographie*, No. 1, 1903.

The Loango-Cabinda Frontier.—The frontier between the Portuguese province of Cabinda and the French Congo was delimited in 1901. On the whole, the line follows pretty closely the watershed between the rivers Chiloango and Loéme from Massabé, but certain sections are determined by parallels and meridians. Thus from the watershed to the confluence of the rivers Bilisi and Luali, the boundary follows the parallel of 4° 34′ 24″·5 S., and then passes along the latter river to its source, so as to leave the fertile district of Chimpéze in French territory. In exchange France cedes to Portugal the region between the meridian of 10° 30′ (12° 50′ 15″ E. of Greenwich) and the crest of the elevations that bound Mayombé. The extreme eastern point is at the village of M'Bamba, on the Chiloango, in lat. 4° 38′ S. and 10° 40′ E. long. (13° 0′ 15″ from Greenwich). The region traversed by the commission may be divided into five zones. Near the coast the country is flat, and the Loémé winds sluggishly amidst papyrus. The soil is sand and clay, and the vegetation consists of tall grass and woods in the hollows. The next zone is more diversified, the vegetation is of higher growth, and the population denser. Then in Mayome is a zone of forest and hilly country where the rivers flow over bars of schists and granite; the vegetable earth is of small depth, but the vegetation is abundant, and the natives are strong and healthy. In the third zone are clay-slates and schists of several kinds, and here the forest attains its greatest luxuriance. Quartzites, quartose sandstones, and laterite from the land of the fourth zone; the forest is less dense, grass only growing on the laterite. East of the Franco-Portuguese frontier is the plain of the Yangalas, extending from the Chiloanga to the Kwilu, which seems to be the ancient bed of a large river. The surface is covered with laterite, and in the rainy season the whole country is inundated. Beyond the plain the land rises again, and a region of sand and limestone stretches to the copper district of Minduli. Formerly the ore was extracted by the natives, but is apparently neglected at present.—*La Géographie*, No. 1, 1903.

Madagascar in 1901.—M. Grandidier publishes in *La Géographie*, No. 1, 1903, a summary of General Gallieni's report. The commerce of the island in 1901 was of the value of 55 million francs (£2,200,000) as against 51 million (£2,040,000) in 1900. Of this sum £1,960,000 represents trade with France and her colonies. The value of the imports was £1,840,000, and of the exports only £360,000. The most important import is cotton goods, which in 1901 were of

the value of £480,000, or £60,000 more than in the preceding year. The sale of cotton goods is generally regarded as a criterion of the prosperity of the natives. Large stocks may, indeed, have been accumulated in the year in question with a view to a demand in the future, but, at any rate, the local merchants must have faith in the progress of the island. Rice occupies the second place among the imports, though Madagascar ought to be an exporting country. The scarcity of roads to carry off the surplus crops discourages this cultivation, and in 1901 locusts caused enormous loss. Progress, however, has been made since 1896, and it is hoped that Madagascar will soon yield enough rice for the local demand. The exports in 1901 showed a diminution of the value of fully £60,000. The chief articles are gold, raphia fibre, and cattle. The value of the gold exported was less by £12,000, and that of raphia by £3400, owing to the fall in the price, for the quantity exported was larger. There was a lively demand for cattle in Réunion, Mauritius, and, above all, South Africa, but the native graziers asked such extravagant prices that the result was a diminution of £13,700 in the value of the cattle exported. Shipping has much increased, and inland transport has made good progress. Native cultivation has been extended, and the number of cattle has risen, so that there are now at least 1,600,000 head in Madagascar. The mining industry has remained stationary. In 1901 provisional titles were granted to emigrants for 369 concessions, bringing the number since 1895 up to 1674, which cover an area of 335,112 acres. There are, besides these, thirty-seven concessions of more than 10,000 hectares (24,710 acres) each.

AMERICA.

The Seward Peninsula, Alaska.—In consequence of the discovery of gold in the Nome district, and the rapid development of mining, the United States Geological Survey sent out a party in 1900 under Mr. Alfred E. Brooks to examine the southern part of the peninsula. The 161st and 168th meridians bound the peninsula approximately on the east and west, while Cape Darby, the most southern point, lies a little south of 64° 30′, and Cape Espenberg on the north is just within the arctic circle. The area of the peninsula is about 20,000 square miles. Its western shore is skirted by a low plain with lagoons and sand-pits, while in the eastern half the coast is bold and rocky. The interior is occupied by uplands 800 to 2600 feet in height, surmounted by isolated peaks and knobs which rise 1500 to 2000 feet higher. In the southern half of the peninsula is a fairly well-defined range divided into three groups—the Kigluaik, Bendeleben, and Darby mountains. The first run about 40 miles from near Cape Woolley to the flat valley of the Kruzgamepa river; they are rugged, and culminate in Mount Osborn at a height of 4700 feet. The Bendeleben mountains extend for 50 miles between the Kruzgamepa and the Kuzitrin, are less rugged, and take their name from the highest peak, about 3500 feet. The Darby mountains, 40 miles long, run northwards from Cape Darby, and have rounded summits not more than 2000 feet high. The York mountains, which run northwards from the cape of the same name, have been little explored; they are rugged like the Kigluaik, and contain peaks rising to 2500 feet. The most striking features of the topography are the broad flat-bottomed valleys, such as the basins of the upper Fish river, the upper Kuzitrin, and the lowland through which flow the Kruzgamepa and upper Niukluk. Mr. W. C. Mendenhall, who ascended the west fork of Koyuk river to a distance of 136 miles from the coast, reports that the hills north of the upper Koyuk are not more than 1200 or 1300 feet high. The first rapids met with were 113½ miles up the river. The oldest rocks of the peninsula are highly crystalline limestones and schists, first noticed in the Kigluaik mountains, among which granite and gneissoid rocks

occur abundantly. The type rock of the Kuzitrin series is a graphitic quartz-schist; the beds are, perhaps, 2000 to 3000 feet thick. The Nome series is made up of limestone, graphitic mica and calcareous schists, and at one locality show a minimum thickness of 5000 to 6000 feet. If certain fossils discovered north of Port Clarence belong to the Nome series, its lower beds are of Lower Ordovician age, while the other two series may be Cambrian or pre-Cambrian. On the Fish river beds, probably of the Nome series, contained Mesozoic fossils. Greenstone is widely distributed. Gold has been found along the coast near Nome, and at several points on the rivers inland. The output of placer gold for the year 1900 has been estimated at £984,690.

The Austrian Expedition to Brazil.—A preliminary report has been received from the leader of the second expedition sent out to Brazil by the Royal Academy of Sciences of Vienna. After landing at Pernambuco, two excursions were made by rail to the neighbourhood of Berberibe and Pas d'Alho, which gave a foretaste of the enormous wealth of bird-life in those tropical regions. A similar impression was made by excursions round Bahia, to Cabula, Rio Vermelho, the neighbourhood of Barra near the Bahia lighthouse, and even on the outermost slopes, covered with vegetation, between the east of the town and the sea. Here was first seen the *Wistiti* (*Hapale Jacchus*), which is peculiar to Bahia and Pernambuco. On the journey to the Rio Sao Francisco extensive ornithological collections were made; a week was spent at Joazeiro, on the right bank of the great river. An imposing representative of the bird world here is the Nandu, or Ema (*Rhea macrorhyncha*). The characteristic mammals of this region are the armadillo (*Dasypus*), pouched rat, and anteater. Fish are abundant in the river, but there are not many species. The Pirá (*Conarhynchus conirostris*), with a long curved tube-shaped snout, and Pacrí (*Myletes*), with a shark's mouth, are remarkable, being of larger size than most of the others. Hofrath Steindachner expects a particularly rich yield of fishes characteristic of the region from the stay at Barra, where the Rio Grande flows into the Sao Francisco. Lacertilians are represented in the neighbourhood of Joazeiro by eight or nine species, including a very delicate dark-striped Scincoid with a blood-red tail. Most of the small variegated or dark-coloured snakes of this region are said to be poisonous. The Ema mentioned above is greatly valued as a destroyer of snakes, and is kept on the haciendas. The kites do their utmost in destroying animal "undesirables," and enjoy the greatest favour all over the country. The whole bird-life of the Joazeiro district resembles that of the Amazon region more closely than that of southern Brazil. In the middle of March the desolate solitudes of the bush were explored, starting from the railway at Carnahyba, and a nearly complete collection of the birds, consisting of some fifty specimens was made. The most characteristic representatives are five species of pigeons and two of parrots.

Expedition to the Central Andes of Bolivia.—Prof. Steinmann, of Freiburg, and two of his fellow-geologists of the same University (Baron Bistram and Dr. H. Hoek), will start in August for Buenos Ayres, *en route* for the Bolivian Andes, which will be reached *viâ* Jujuy, Tarija, Sucre, and Cochabamba. After a prolonged stay in the mountains the travellers will probably work their way to Antofagasta *viâ* La Paz. The outfit is of the most modern description, and Dr. Hoek is one of the most capable German mountaineers.

POLAR REGIONS.

Arctic Expeditions.—Captain Roald Amundsen, whose projected expedition to the northern magnetic pole has been fully described in the *Journal*, sailed from Christiania on June 16. He hopes, if possible, to return through Bering Strait,

thus once more accomplishing the north-west passage. The Ziegler expedition of the present year, under the leadership of Mr. A. Fiala, made a final start from Tromsoe on June 27, intending, however, to call at Archangel before reaching Franz Josef Land.

The German Antarctic Expedition: Return of the "Gauss."—Telegraphic information was received on June 2 that the *Gauss*, with all well on board, had arrived at Durban *en route* for Cape Town. From the scanty details yet made public, it appears that the expedition has been a successful one, the *Gauss* having behaved splendidly, though the highest latitude reached by the ship was 66° 2′ S., or just outside the antarctic circle, where winter quarters were established off a newly discovered land in 89° 48′ E. long. The ship was frozen in in ice 30 feet thick, while the snow was 30 to 40 feet in depth. Sledge-journeys appear to have been made during the stay at the winter quarters, and many members of the expedition are said to have suffered from frost-bite and snow-blindness. Further details, which will be awaited with much interest, should be available before long, as the leader, Dr. von Drygalski, forwarded his report immediately on arrival at Durban. Among the geographical results of the expedition is the discovery of the non-existence of Termination island, the site of which was passed over by the expedition, while no trace of land was seen in the neighbourhood.

Nordenskiöld Relief Expeditions.—As already announced, an expedition is being organized in Sweden for the relief of Dr. O. Nordenskiöld, who has been unable to return north during the past season in accordance with his original plan. The sum of 200,000 kronor, voted by the Swedish parliament, has been supplemented by contributions from private individuals to the extent of 50,000 kronor, and the Norwegian steamer *Frithjof* has been hired for the purposes of the expedition, which will start from Stockholm about August 15. Its leader is Captain O. Gylden, of the Royal Swedish Navy, son of the late well-known astronomer, and captain of the *Antarctic* during the voyage to Spitsbergen in 1901, in connection with the operations for the measurement of a degree. Some anxiety is naturally felt for Dr. Nordenskiöld and his party, but it is hoped that the supplies taken out, which would be barely sufficient for a second winter, may be supplemented by the fresh meat afforded by seals and penguins. At the instance of Dr. Moreno, the Argentine Government has also decided on the despatch of a relief expedition, should no news of the explorers be received before the next spring of the southern hemisphere.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Prof. Agassiz on Barrier Reefs and Atolls.—In a communication to the Royal Society, read in March last, and printed in vol. lxxi. of the *Proceedings* of that body, Prof. A. Agassiz sums up the results of his twenty-five years' observations on coral formations in the Atlantic, Pacific, and Indian oceans. He has made no attempt to establish any general theory, but has confined himself to a description of the different types of reefs and of the causes to which they probably owe their formation. The barrier reefs of Fiji, Hawaii, and the West Indies are found to usually flank volcanic islands, and to be underlaid by volcanic rocks. Those of New Caledonia, Australia, Florida, Honduras, and the Bahamas are underlaid by outliers of the adjoining land masses, which crop out as islands on their very margins. In the case of some barrier reefs, in the Society islands and elsewhere, wide and deep lagoons have been formed by erosion, from a broad fringing reef flat, while encircling reefs hold to their central island or islands the same relation which a barrier reef holds to the adjoining land mass. Denudation and submarine erosion fully account for the formation of platforms, upon which

the various organisms may build either barrier or encircling reefs or even atolls. Another type is formed by the reef-flats and outer reefs flanking elevated islands—either wholly composed of limestone or in part volcanic—in the Paumotus, Fiji, and elsewhere. They partake of the nature both of barrier and fringing reefs. A passage may be traced from such elevated islands, like Niue, through various forms to that of atolls in which only a small islet or larger island of the limestone or volcanic rock remains. Sometimes the underlying base of the atoll is not known, and some atolls are mere shallow sinks formed by sandbanks. Throughout the Pacific, the Indian ocean, and the West Indies positive evidence exists, in the form of bosses, pinnacles, and undermined masses of modern or Tertiary limestone, of a moderate, recent elevation of the reefs. Signs of the solvent action of the sea are also to be seen everywhere, while atmospheric denudation has played an important part in reducing elevated limestone islands to the level of the sea. Closed atolls can hardly be said to exist (there being always some means by which the lagoon is fed by the sea), and the land area of an atoll is relatively small compared to that of the half-submerged reef-flats. The Maldive archipelago supplies overwhelming testimony that atolls may rise from a plateau of suitable depth, however it may have been formed, and whatever its geological structure. The great coral-reef regions are within the limits of the trades and monsoons, and are areas of elevation, with the exception of the Ellice and Marshall, and some of the Line islands. In the regions examined, the modern reef-rock is of very moderate thickness, within the limits of depth at which reef-builders begin to grow, and within which the land rims of atolls or barrier reefs are affected by mechanical causes. The Marquesas, Galapagos, and a few other islands, though within the limits of the coral areas, have no reefs, owing to the steepness of their shores, and to the absence or crumbling nature of their submarine platforms. Lastly, it is pointed out that corals grow sparingly in lagoons where coralline algæ grow most luxuriantly, and that nullipores and corallines form an important part of the reef-building material.

Ice in Rivers.—Observations of the number of days on which ice has been present in the river Hahle at Duderstadt (South Hanover) have been kept almost continuously since 1893 by Herr L. Koch, who gives a summary of the general results of the observations in the *Deutsche Rundschau für Geographie* (vol. 25, part 6). The writer remarks that the temperature of the water has a much greater influence on the duration of an ice-covering of rivers than that of the air, and that December on this account has on the average fewer days on which the streams are ice-bound than either January or February, as, however low the air-temperature may fall in the early part of the winter, the water still retains some amount of warmth. In February the cooling of the water is counteracted to some extent by the rising temperature of the air, so that the number of days then shows some diminution. Thus during the period of observation the number of days on which the river was entirely ice-bound averaged, for the three months respectively, 1·3, 3·1, and 2·6. The conditions seem, however, equally favourable to the formation of loose ice in February, which shows a fractionally higher average number of days with such ice than even January, the figures being 2·6, 4·8, and 4·9 for the three winter months. The average total number of days with ice during the winter was 21 (the extremes being 35 and 4), but on seven only, on an average, was the river entirely ice-bound. Last winter was an abnormal one in the extent of the ice-formation in the early part of the winter, the figures for December alone surpassing the average for the whole winter.

Alpine Glaciers in their Relation to Rivers.—In the *Rivista Geogr. Ital.*, No 3, 1903, Prof. Marinelli gives a summary of the researches of the engineer

Signor Fantoli concerning the contribution of glaciers to the river discharge. He has measured the areas of the glaciers in the Verbano (Maggiore) and Lario (Como) basins. In the latter the glaciers occupy an area of nearly 67 square miles, or about 3·8 per cent. of the whole basin (1795 square miles), while in the Verbano they cover 42 square miles, or about 1·8 per cent. of the basin (2394 square miles). These data are drawn from the last Italian and Swiss surveys, and refer to about the year 1855, when the extent of the glaciers was a minimum. Measures from maps of the middle of last century give an area in the Verbano basin of nearly 49 square miles, or 16 per cent. larger. From a careful examination it has been found that during the warmest days of the year two-thirds of a cubic metre per second are removed from each square kilometre of the glaciated area, which correspond to a thickness of 5–6 centimetres (2–2·4 inches) in the day, while the drainage from the parts of the basin not covered with ice amounts to only 10 litres per kilometre, or only a sixty-seventh of the above. Consequently, during the dry summer season the glaciers of the Verbano, with their area of 42 square miles, contribute more than half the total drainage of the basin, and in the Lario basin more than two-thirds. A rise of one degree (C.) of temperature at this season removes from the glaciated surface an additional thickness of 0·45 centimetre (0·18 inch) per day, whereas in the basin of the Rhone the increase is only 0·24 centimetre (0·09 inch). The explanation of this difference may be found in the fact that in the latter basin 60 per cent. of the glaciers lie above 3000 metres (9800 feet), whereas in the Verbano basin the percentage is 22·5, and in the Lario 38·5. Observations are wanting to determine the action of heat at different hours of the day. Signor Fantoli has also studied the effect of condensation of vapour from the air in contact with the glaciers. In the Lario basin he calculates that in August the vapour condensed amounts to about 2·5 litres per second and per kilometre. And, again, the latent heat thus set free produces a fusion of ice which he calculates at 19·5 litres per second and per kilometre. The total fusion from this source is, then, 22 litres (12·6 gallons per square mile), while the total discharge of the glaciers is 46·8 litres (26·7 gallons).

OBITUARY.

Thomas Godolphin Rooper.

It is with great regret that we have to record the death of Mr. T. G. Rooper, M.A., one of His Majesty's inspectors of schools. Mr. Rooper was warmly interested in all sound educational methods, and possessed in the highest degree the power of communicating his enthusiasm to others. His loss in the educational world can hardly be overestimated, and the cause of geography in particular has lost a valuable and influential supporter. When stationed at Bradford, he did much to stimulate an interest in geography, and to improve the methods of teaching it by organizing a geographical exhibition, starting and paying for the first Teacher's Certificate classes, planning geographical readers on sound principles, securing the production of an excellent contoured wall map of Yorkshire, as well as by lectures and private conversations. In Southampton he took the leading part in the foundation of the Southampton Geological Society, which owes much of its success to him. Mr. Rooper became a Fellow of the Royal Geographical Society in 1895, and served, up till the time of his death, on the Special Education Committee. He prepared a report on "Hints on the Drawing up of Syllabuses of Geography for

Elementary Schools," which, unfortunately, he did not live long enough to finish. This report, completed by Mr. Chisholm, will shortly be published. Mr. Rooper may be said to have died, as he would himself have wished, in harness. He possessed a singularly lofty character and an attractive personality. His friends and colleagues have to deplore the loss of a truly lovable and high-minded man as well as of a devoted public servant.

CORRESPONDENCE.

The 'Tanganyika Problem.'

I MUCH regret that, in venturing to criticize some of the geological, palæontological, and zoological speculations in Mr. Moore's 'Tanganyika Problem,' I should have incurred that gentleman's anger to so serious an extent as to have caused him to write the sarcastic letter which appeared in the *Geographical Journal* for June (p. 682). Mr. Moore might, I think, have remembered that a recourse to sarcasm in place of argument generally indicates that a speaker or writer has a bad case—and knows that he has. To the greater part of Mr. Moore's letter it is unnecessary to reply, but there are a few scientific questions of importance involved, and it is as well to clear them up. To prevent any misunderstanding, I must say that my omission to notice some of the statements contained in the letter does not imply that I admit that those statements are correct.

The greater part of Mr. Moore's letter is, in fact, a very good specimen of what is commonly known as special pleading, and I can congratulate the writer on the skill with which, in several cases, he has suggested an inference favourable to his views without committing himself to a definite statement, or he has credited me with his own mistakes. As one instance, I may call attention to his remarks (p. 683) on a certain echinoderm cited as evidence of the marine origin of the Drummond's beds. As these beds are classed by Mr. Moore as Triassic (they are, in fact, older, as will be seen presently), and the echinoderm was stated by him to be Oligocene, I pointed out that this fossil could not have come from the Drummond's beds at all. "But," Mr. Moore replies, "is it an Oligocene species, and if so, is this species possibly Triassic also?" Now, the Oligocene age of the fossil rests upon Mr. Moore's statement, not mine (I shall have occasion to refer to this matter again), and I can hardly suppose that Mr. Moore is so ignorant of elementary palæontology as not to know that echinoderms are some of the most characteristic fossils known, and that the idea of a species being both Tertiary and Triassic is absurd. So far as is known, no species, scarcely a genus, and only a small minority of the families of echinodermata found in the two periods are common to both.

Another instance in which Mr. Moore charges me with his own error is to be found in his observations, at the bottom of p. 682 and the top of p. 683, on my remark that the bivalve shells of Lake Tanganyika are exclusively fresh-water types. Mr. Moore had referred all of them to purely fresh-water genera, and I accepted his determinations.

It may be noticed that in the commencement of his letter Mr. Moore compares himself to a military leader, and he naturally adopts military methods. The examples just cited are *ruses de guerre*. I have no wish to waste time upon these purely polemical matters, but, as I have stated, there are a few questions of scientific interest, and to these I will reply briefly.

To take a purely geological point first. Mr. Moore, at the end of the third paragraph in his letter (p. 683), dealing with the "rift-valleys," states that "these valleys are usually folds, they are not 'longitudinal blocks let down by trough faults,' as Dr. Blanford dogmatically asserts." May I beg every reader who wishes to form a judgment on this matter to turn to the lower diagrams on the plates opposite pp. 42 and 44 in Mr. Moore's book, 'The Tanganyika Problem'? It requires very little familiarity with geological sections to enable any one to judge whether these sections agree with Mr. Moore's account of the structures or with mine. My description of the nature of the valleys was founded on the accounts by Suess and Gregory, confirmed by Mr. Moore's own sections.

Probably the most important geographical question noticed in Mr. Moore's letter is that relating to the so-called Drummond's beds on Lake Nyasa, because his argument that the sea occupied parts of Central Africa in early Mesozoic times is an essential part of his proposed solution of what he terms the Tanganyika problem, and his attack on the views of Murchison and Gregory ('Tanganyika Problem,' pp. 32, 72, etc.; 'Great Rift-valley,' p. 214), who held that Central Africa has never been under the sea, are mainly based on the evidence afforded by the Drummond's beds' fossils, no organic remains being known from the other Mesozoic and Palæozoic rocks of the area. I gave reasons (p. 290) for not accepting the marine origin of the Drummond's beds, and for believing it more likely that these deposits, like the Karoo formation of South Africa, are of fresh-water origin and largely fluviatile. Mr. Moore replies, "It may be stated for general information that these beds (Drummond's) are like nothing at all in South Africa, and whether they are marine or not, they are not fluviatile, unless deposits like our Lancashire limestones are to be considered as having originated in rivers." I may point out that I did not say that the Drummond's beds were like anything in South Africa. I wrote of them as representative, but I question whether Mr. Moore's acquaintance with South African geological formations justifies his sweeping assertion of the difference between the two. I do not think I am misinterpreting Mr. Moore's remark about the limestones if I understand him as expressing an opinion that rocks "like our Lancashire limestones" (carboniferous limestone, I presume) are evidence that the strata in which they occur are not of fluviatile origin. If this is his meaning, Mr. Moore is mistaken. Limestones are of frequent occurrence in fresh-water beds, whether fluviatile or lacustrine. I think most British geologists must know the limestone beds in the Hastings sands, which are generally regarded as deposited by rivers; and I may add that calcareous beds, which in older rocks would become limestones, abound in some of the fluviatile deposits of the Ganges and its tributaries. The limestone did not necessarily "originate in rivers" as limestone, but is probably due to the subsequent percolation of water containing salts of lime in solution.

The facts about the Drummond's beds are very imperfectly stated in 'The Tanganyika Problem,' and certain data which are of great importance as evidence of the origin of these strata are not mentioned. I have, therefore, tried to ascertain something more of these beds, with the following result (the facts are taken from Mr. J. Stewart's paper, *Proc. Roy. Geo. Soc.*, vol. iii., 1881, pp. 264, etc.; Prof. Drummond's 'Tropical Africa,' 1881, pp. 183–199; and an article by Prof. Rupert Jones in the *Geological Magazine* for 1890, p. 553).

The beds in question are represented in Mr. Moore's map, opposite p. 48 of the 'Tanganyika Problem,' as occupying a considerable area west of Lake Nyasa, near its northern end. They consist, according to Prof. Drummond, of "thin beds of very fine light grey sandstone, and blue and grey shales with an occasional band of grey limestone." Some coal occurs in the neighbourhood, and is

apparently associated with the same strata. (Mr. Moore has omitted to notice the occurrence of this coal.) In some of the beds remains of ganoid fishes and bivalve mollusca were found by Prof. Drummond; the fishes were described by Prof. Traquair, and referred to *Acrolepis*, a Palæoniscid ganoid, and the mollusca were doubtfully assigned by Prof. Rupert Jones to the genus *Iridina*. The latter have been re-examined by Prof. Amalitsky, who (*Quart. Jour. Geol. Soc.*, 1895, p. 341) refers them to the fresh-water Permian genera *Palæomutela* and *Palæanodonta*, belonging to a group from which the modern *Unionidæ*, or pond mussels, may possibly be descended. Closely allied, if not identical species, of the two molluscan genera named occur in the fresh-water Permian strata of Russia, and in the Karoo series of South Africa at Kimberley, Graff Reinet, and other places, and in the latter localities, or some of them, as in the beds on Lake Nyasa, remains of the ganoid genus *Acrolepis* accompany the mollusca. Quite recently (*Quart. Jour. Geol. Soc.*, 1903, pp. 285–287) the same association of *Acrolepis* and *Palæomutela* in coal-bearing strata has been reported from Rhodesia. Similar land-plants (*Glossopteris*, etc.) and terrestrial reptiles are met with in both the Russian and South African rocks, and these formations, in which no marine fossils have been found, are generally admitted to be fresh-water deposits. Prof. Rupert Jones formerly regarded the mollusca from the Karoo beds as of estuarine or salt-lake rather than of river origin; and I was myself at one time disposed to think them estuarine or marine, but the reasons for the view I then held no longer exist, further discoveries of the relations between the floras and faunas of the Permo-Carboniferous beds in South Africa and Russia having made it evident that both areas in Upper Palæozoic times were parts of the same continental tract.

It may be added that the same kind of *Palæanodonta* as that occurring in the Drummond's beds was obtained by Gregory from rocks in the Sabaki valley near Mombasa, and recognized by him as evidence of the fresh-water origin of the rocks.

I have thus accounted for the ganoid fishes and bivalve mollusca of the supposed marine beds of Nyasa. The so-called Oligocene echinoderm is a mystery, for although Mr. Moore ('Tanganyika Problem,' p. 72) professes to take the statement of its occurrence from 'The Great Rift Valley,' p. 230, there is no mention on that page, nor, so far as I can trace, elsewhere in Prof. Gregory's book, of any Oligocene echinoderm; although there is a reference to an Eocene fossil, whether an echinoderm or not is not stated. This, however, is of minor importance. The fossil, whether Oligocene or Eocene, could not have come from the Drummond's beds, as I pointed out before.

I am sorry that there should be occasion to repeat these rather dry details, but as Mr. Moore has replied to my criticism of his book by charges of false assumptions and hints that my assertions were unfounded, I am obliged to show what is the evidence on which I depend, and what is the worth of the statements and assumptions contained in such phrases of his as the following ('Tanganyika Problem,' p. 72): "It would thus appear that at some time there was in this region (Nyasa) a fauna consisting, at any rate, of ganoid fishes, echinoderms, and molluscs, or, in other words, a marine fauna." And again (p. 73): "Thus it would appear that there was once a marine, possibly a Triassic or Jurassic, fauna in the region of the north end of Nyasa."

Mr. Moore expresses his contempt for conchology, which he says he always regarded "as somewhat trivial—as, in fact, more of a waste of time than a science," and his remarks on geological and palæontological questions appear to show that he has the same low opinion of palæontology and geology. To judge by the instances already given, Mr. Moore's views on geology and palæontology are not founded on

a thorough acquaintance with those sciences. With reference to his contempt for conchology, it should not be forgotten that his evidence of the Jurassic affinities of the halolimnic mollusca of Lake Tanganyika is, as he quite fairly states, entirely conchological. But if the Jurassic affinities of the halolimnic mollusca are founded on trivialities, and the older Mesozoic sea of Central Africa on evidence half of which is ignored and the other half misinterpreted, what becomes of Mr. Moore's solution of the 'Tanganyika Problem'?

The points about the *Pseudo-melanias* and the migration of *Tilapia burtoni* are really unworthy of reply. There is no evidence that *Tilapia burtoni* migrated from Tanganyika to Kivu after the latter became a lake, or that *Melania tuberculata*, which inhabits both lakes also, wandered from one to the other. Either or both may have inhabited streams in the Kivu area before Lake Kivu existed. Of course, Mr. Moore does not imagine that *Limnea*, *Planorbis*, *Vivipara*, and *Unio* all descended from the *Pseudo-melanias*, but if not, his reply is worthless. The only case in which a remark of his is really worth attention is that in which he compares Huxley's suggestion of what that author calls the polyphyletic descent of certain genera to his own hypothesis of the origin of fresh-water faunas. No doubt there is a certain connection between the two ideas, but at the same time Mr. Moore's hypothesis is much more akin to the sporadic theories of authors like Alcide D'Orbigny and Louis Agassiz, than to Huxley's polyphyletic hypothesis.

There is one more paragraph of Mr. Moore's that requires notice. In the 'Tanganyika Problem,' p. 20, he states emphatically that there is no evidence that there has been any connection between Africa and America since the origin of types now common to both. I suggested that Mr. Moore could not have been acquainted with the writings of Suess and others; and his reply is rather surprising. "Well," he says, "but what if I had read Suess's 'Antlitz der Erde,' if I knew something of Beddard's and Neumayer's observations, if I have also a vivid recollection of several discussions with Dr. Gregory upon this very subject, and if, after all this, I had and still 'hae mi doots' about there ever having been a connection between the continents at all?" I can only reply that in that case it is unfortunate for Mr. Moore's credit for scientific accuracy that he should have "dogmatically" asserted that no evidence existed, and still more unfortunate that he should regard his error as a cause for self-laudation. I should never have suspected Mr. Moore of having deliberately denied the existence of evidence with which he was well acquainted if he had not admitted his knowledge, and I do not think his reputation as a scientific writer will gain by his confession. I can only suggest that, having failed to find in my criticism of his work an illustration of what he elegantly terms "explosive arguments which have a nasty habit of going off inside his own trenches," he has been minded to afford a brilliant example of his own figure of speech.

I may say, however, that despite Mr. Moore's "doots," biological evidence as to the former land-connection between Africa and South America has accumulated rapidly of late. Two papers on the subject have been sent to me by their authors since my review of the 'Tanganyika Problem' appeared in the March number of this *Journal*, and I have seen the abstract of a third. The first of these, by Dr. Scharff, entitled "Some Remarks on the Atlantis Problem" (*Proc. Roy. Irish Ac.*, vol. xxiv.), contains a large amount of detailed information on the biological relations of the two continents; the second, by Dr. A. E. Ortmann of Princeton University, entitled "The Geographical Distribution of Fresh-water Decapods and its Bearing upon Ancient Geography" (*Proc. Am. Phil. Soc.*, xli., 1902, pp. 267–400), is a most important contribution to the discussion; and the third, by Mr. R. I. Pocock, read before the Zoological Society in April last, was on the "Geographical Distribution of the

Megalomorphæ" (spiders). All these writers show that strong evidence exists in favour of a former union between Africa and South America. It should be added that no groups of animals are better adapted to the study of ancient distribution than spiders and fresh-water crustaceans.

There is one remark I must add in conclusion, and that is that I shall not notice any further contributions of Mr. Moore's to this discussion, unless such contributions are written in a very different tone from that adopted by him in his letter published in the last number of this *Journal*.

W. T. Blanford.

Ptolemy's Scotland A.D. 140, and the Latest Upheaval on the West Coast.

Poltalloch, Lochgilphead.

The hill Dunadd, beside the river Add, stands about 2 miles from my house, and has long been a source of great interest to me.

There are evident geological signs that at one time the present Loch Awe, then a river, flowed to the sea between the site of my house and Dunadd, the stronghold in Scotland for at least two hundred years of the Dalriad kings, who came from Ireland. To a military eye Dunadd has now not much to specially recommend it as a place of strength for men whose connections were with Ireland, as between it and the sea stretches the big Crinan moss, through which the river Add winds its devious course; but if the sea came up to the foot of the hill or close to it, and the Awe as well as the Add flowed into the larger Crinan bay, then the military eye, in the days before gunpowder, would rejoice in the site.

I have long sought to find proof that in the comparatively recent days of the Dalriads the Awe did flow into Crinan bay, and to find the date when it ceased to do so. I think I have found both.

Ptolemy, in his map of Scotland dating from *circa* A.D. 140, shows his first station northwards from the Epidium Promontorium, or Mull of Cantire, as Λόγγου ποταμοῦ ἐκβολαί. This station is $1\frac{1}{2}$ degree east * from the Promontorium—a distance which, when converted into stadia on the Ptolemaic basis of 500 stadia to an equatorial degree, gives 400 stadia, or 40 nautical miles. Crinan bay, I find by Admiralty chart, is 48 miles, not far from the 40 of Ptolemy. I leave it to others to decide whether the Longus or λόγγος of Ptolemy is or is not a proper name—that is, whether the meaning is the mouth of *a* long river or of *the* long river, or of the river called "Long," merely noting that he writes a Latin word in Greek letters, but it may be of interest to know that the meaning attached to the Gaelic name Fadha, now called Add, is Long. I further find that A.D. 736 Dunadd was attacked and taken. Also the Annals of Ulster state that there was an earthquake in Ili (the Islay of to-day?) in A.D. 740, and that Dunadd was given up in A.D. 741.

It thus seems to me to be evident that the earthquake which accompanied the great 30-feet lift along the west coast of the Highlands, and which tilted up the bed of the Awe, damming the river and making it flow through the then opened pass of Brander, occurred A.D. 740. Also that Longus (λόγγος) was probably the Latin translation of the native name of the river, the Long, for it had its rise in

* Ptolemy's map, as is well known, makes Scotland lie west and east instead of north and south, and this station is really on the west coast of Argyll.

the springs of the Orchy and Stral, and was really a river of considerable length, and Ptolemy's map shows that it was flowing properly as late as A.D. 140. But when the upheaval came, Dunadd would be cut off from the sea, and most probably a horrid marsh took its place, making it worthless as a stronghold.

Moreover, I think it not unlikely the name Long adhered to the river which continued to flow into Crinan bay, being shifted from the former Awe to the present Add.

I claim no credit for abstruse researches; only a little local knowledge and an interest in the question. My facts come from a series of papers by the late Captain Thomas, R.N., contributed to the Society of Scottish Antiquaries some years ago.

E. D. MALCOLM,
Colonel late R.E.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1902-1903.

Anniversary Meeting, May 18, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

THE Secretary read the minutes of the last Anniversary Meeting.

ELECTIONS:—*General Sir G. Digby Barker, K.C.B.; Commander Cuthbert Chapman, R.N.; Captain Henry Langrishe Cottingham, R.F.A.; James Currie; Lieut. John McClean Griffin, R.F.A.; Richard A. Hall; Henry Caborn Harper; Captain Claud Percival, Rifle Brigade; Jamieson Robertson; Hobart Chatfield Chatfield-Taylor.*

The presentation of the awards then took place.

The PRESIDENT: Mr. Douglas Freshfield, the Council has selected you as the recipient of the Founder's Medal this year, and the selection has received the approval of His Majesty the King. The Council considered that you had well earned the Medal by your explorations commencing thirty-six years ago in the Caucasus and continued on several other occasions, during which time you made very important additions to our knowledge of the physical geography of that important range of mountains, and also for your journey at a very high level round Kanchinjunga, on which occasion you added largely to our knowledge. There were your services in the field, for which you have so well earned this medal. But the Council was also mindful of your long services to geography during a course of upwards of thirty years, and especially of the valuable work you have done in promoting geographical education. It is a great pleasure to me that it should be my duty to present the medal to you, when I remember the long term of years during which we worked together for a common object, always preserving friendly and harmonious relations with each other, and I now have much pleasure in placing the Patron's Medal in your hands.

Mr. DOUGLAS FRESHFIELD: It is now my duty to express to the Council my sincere gratitude for the very kind appreciation they have shown of my geographical career by recommending me to His Majesty for the Founder's Medal, the oldest honour which is in the gift of the Society. I think few recipients have been in a position to appreciate it more thoroughly than I am, for during the fifteen years I served on the Council, or as one of your hon. secretaries, I had constant and frequent opportunities of watching the extraordinary care and solicitude

which the Council showed in choosing candidates for these medals, in looking not only over the wide field of Great Britain and its Colonies, but over the whole world and selecting those they thought best qualified, irrespective of nationality. We are none of us good judges in our own cause, and surprised though I am that this honour comes late to me in life, it is not for me to dispute the wisdom of the Council; but I cannot help thinking that they may have been influenced by sympathy with the aims I have had in view rather than by any actual successes I may have won, either as a mountaineer or an explorer, or as an educational geographer. If you will allow me, I will briefly put before you the record of what those aims have been. I have, during the last fifty years, frequented the Alps, explored the Caucasus, and visited one of the regions—perhaps the most interesting —of the vast Himalaya. As a mountaineer, I have tried to prevent mountaineering from becoming a form of sport and to keep it in its proper place as a branch of travel. By precept and example I have done my best to persuade my comrades to keep their eyes open to all the interest, historical, scientific, and artistic, in which the mountains abound. In doing this, I have followed in the footsteps of your old colleague, Mr. John Ball, who devoted his time to first exploring and then describing the Alps at a time when many geographers thought them beneath their notice. You have been kind enough, sir, to refer to the small part I have played in geographical education. Twenty-six years ago, when Mr. F. Galton first drew the attention of the Council to the work which was needed in this direction, I took the matter up. Since then a great deal has been effected. We have, in the first place, our old casual *Proceedings* turned into the *Journal*, the most important publication of its kind in Europe, mainly kept in that position by my friend Mr. Keltie's care. We have brought photography into full play to illustrate the evening lectures as well as the articles in the *Journal*. We have done a great deal to persuade the controllers of the Ordnance Survey to bring it up to the level of other countries. I think the present Director has fulfilled every single demand we have made on him. And, last of all, more strictly educational —I am not going into details—we have succeeded in establishing a flourishing School of Geography in the University of Oxford, a School which has already spread its influence through the rest of the kingdom. We have done much besides which I must not dwell upon. In all this work, sir, I have been acting on lines you started, or with your full sympathy. You, Mr. Chairman, preceeded me and succeeded me, and you must allow me to say it is with peculiar pleasure that I take this medal from the hands of one to whose inception, energy, and untiring devotion, geography in Great Britain owes so much. I will only add one other remark, and that is, that it gives an additional charm to the medal, that it makes another link between me, however unworthy I may be, and the first explorer of Kangchenjanga, the illustrious Nestor of geographical science, Sir Joseph Hooker.

The PRESIDENT: Dr. Sven Hedin, the Victoria Medal of this Society, as perhaps you are aware, was instituted about two years ago for geographical research independent of travel; and you will understand, I hope, that it is conferred upon you exclusively for your merits in the researches you have undertaken. The Council considers that your work connected with the great plateau of Central Asia, and the Tarim valley, is of such importance that you have by that alone won for yourself a claim to our Victoria Medal. You have in a most remarkable way prepared yourself from your early youth to make these researches and to make them thoroughly. If it was necessary that you should know the history of a region in order to inquire into its geographical changes, you have studied that history exhaustively; if it was necessary that you should know the languages

of the countries you visited, you studied and mastered those languages. In every department that it was necessary for you to gain knowledge, you made yourself a master, and in that way your researches became of great value. I take this opportunity of congratulating you on the grant that has been made you by the Swedish Parliament in order that your great labours may be satisfactorily utilized. The medal is granted not only for your work in the Tarim valley, but also for your remarkable researches, both historical and geographical, in elucidating the questions relating to the Lob region. These were the reasons which influenced our Council in selecting you for this honour. I have now great pleasure in placing the Victoria Medal in your hands.

Dr. SVEN HEDIN: May I express my deep gratitude for the great honour which has been bestowed upon me by the Royal Geographical Society, and for the kind words which you have addressed to me. I quite realize the high value and the great importance of this medal, which has been given away only once before, and which is regarded as an honour for geographical scientific work. I take it, the Council of the Royal Geographical Society regard this honour as an encouragement to go on on the same lines as I have gone before, and I shall try in the future to get some more materials and more knowledge of the geography of Central Asia. The time of adventurous journeys will soon be gone. We are just at the beginning of a new era in geographical science. During the three following years I hope I shall be able to show the results I have won during my last journey, and I hope the Council of the Royal Geographical Society will not have any cause to regret the great honour it has conferred upon me. I thank you, Sir Clements Markham, very much for the kind words you addressed to me concerning the grant I got from our Parliament, and by its aid I hope to be able to give to the world a very great publication with regard to the different materials collected during my journey—special maps, in an atlas of two volumes in folio and the text in five volumes. It will be published in English, as English is the language which is governing the world, and which will be understood by scholars and geographers in other countries. The part of Central Asia I have visited, I am sure will be of very great interest not only to geographers in England, but also to politicians. I express once more my deep gratitude.

The PRESIDENT: Baron Rammel (*Chargé d'Affaires* of Sweden and Norway), we had very great pleasure, when Captain Sverdrup was in England, in greeting him and hearing the account of his important discoveries in the Arctic Regions, and I then took the opportunity of delivering to him the Patron's Medal, which was awarded by the Council and received the approval of the King. We all, I can assure you, highly appreciate the importance of the discoveries made by Captain Sverdrup, and the admirable way in which he conducted his expedition. It is now my great pleasure to announce to you that one of our awards, the Murchison Award, has been given to one of Captain Sverdrup's principal followers, Captain Isachsen. Captain Isachsen is an excellent draftsman and a good surveyor, and he conducted his sledge journeys under the orders of Captain Sverdrup in a way which enabled him to make what to me was the most interesting part of the discoveries: that is to say, the discovery of the two large islands extending away to the westward beyond the meridian of the eastern coast of Melville Island. By this discovery, I consider that he filled up the last great gap in our knowledge of arctic geography. Captain Isachsen has selected a gold watch as the form that the award should take, and I now have great pleasure in requesting you to forward it to him.

Baron RAMMEL: On behalf of Captain Isachsen I beg to express his gratitude for the high distinction you have conferred upon him.

The PRESIDENT: The Gill Memorial has been given to Mr. Ellsworth Huntington

for a very remarkable journey through the great cañon of the River Euphrates, and the Cuthbert Peek Grant to Major Burdon for very useful route-maps in Northern Nigeria. Neither of those gentlemen are able to be present at the meeting. The Back Grant has been given to Dr. W. G. Smith for his investigations into the geographical distribution of vegetation in Yorkshire, a valuable, and, I consider, most interesting paper.

The Presidential Address was then delivered (see p. 1).

Mr. Douglas W. Freshfield: I have been informed by my friend, Major Darwin, your hon. secretary, that I must not introduce any contentious business to this meeting. Perhaps he was thinking of ten years ago. But the business I have to introduce cannot be considered as contentious in the slightest degree. It is to propose a vote of thanks to our President for the admirable address he has just given us. There is a certain appropriateness in my doing it. One of my last acts as your secretary was to send a telegram to Sir Clements Markham in Sicily, "Elected President; wire acceptance." I think it was my best act during my thirteen years of office. During the ten years that have since elapsed, he has given the Society not only his time, activity, and experience, but he has given something more: he has given to the Council of the Society enthusiasm—and even the best of councils require enthusiasm. I hope he may be President for some time to come, after our Antarctic anxieties are over, because we shall want his energy to assist in housing the Society in a new building, and I know no man who has such power of getting money out of other people's unwilling pockets as Sir Clements Markham, and even of tackling a Chancellor of the Exchequer. And meantime we geographers, who have a liking, perhaps, for the air of the torrid or temperate zones, and prefer to take our snow and ice in more homœopathic doses, feel grateful to Sir Clements Markham for the way in which he keeps an eye upon all parts of the globe from China to Peru, and yet finds time to assist in the important task of bringing up the rising generation to a better knowledge of the world we live in. I beg to propose a vote of thanks to Sir Clements Markham for his services.

Sir Thomas Holdich: I have very much pleasure in seconding Mr. Douglas Freshfield's proposal.

Sir Clements Markham in response said: It is a source of the greatest pleasure to me to receive the approbation of any assemblage of Fellows of this Society. You must all feel that I have been here a great deal too long in this chair. No one has ever approached me except Sir Roderick Murchison, whom I have beaten now by a year and a half. I should have asked to be allowed to retire before now, had it not been that I felt it absolutely necessary that I should see our gallant explorers in the south through the wood, before I go. There are many younger men who would do the work better than I can hope to do it in the future. But still I must say when I retire from this chair I shall do so with regret, because of the kindness I have always received from my associates, the Fellows of the Society.

The Report of Council was then read; it will be issued with the next edition of the Year Book.

The President then announced that the Council, as proposed, had been duly elected. The list is as follows, the names of new members, or of those changing office, being printed in *italics*:—

President: Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents:* Colonel G. Earl Church; Colonel Sir Thomas Hungerford Holdich, R.E., K.C.I.E., C.B.; *Lord Lamington, G.C.M.G.*; Admiral Sir F. Leopold McClintock, K.C.B., D.C.L., F.R.S.; Sir George S. Mackenzie, K.C.M.G., C.B.; Field-Marshal Sir Henry W. Norman, G.C.B., G.C.M.G., C.I.E. *Treasurer:* Edward L. Somers Cocks. *Trustees:* Right Hon. Lord Avebury, D.C.L., F.R.S.; Lord Belhaven and Stenton. *Honorary*

Secretaries: Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary:* Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors: Admiral Sir Lewis A. Beaumont*, K.C.M.G.; Prof. T. G. Bonney, LL.D., F.R.S.; *Hon. George C. Brodrick*, D.C.L.; Admiral Sir James Bruce, K.C.M.G.; *J. Annan Bryce*; Sir H. E. G. Bulwer, G.C.M.G.; Prof. J. Norman Collie, F.R.S.; Colonel J. Cecil Dalton, R.A.; Prof. E. J. Garwood, F.G.S.; *Right Hon. Sir George D. T. Goldie*, K.C.M.G., F.R.S., D.C.L.; D. G. Hogarth; Colonel D. A. Johnston, R.E.; *Sir Harry H. Johnston*, G.C.M.G., K.C.B., L. W. Longstaff; Howard Saunders, F.L.S.; *General J. H. M. Shaw Stewart*, R.E., F.R.S.E.; H. Yates Thompson, J.P.; Admiral Sir Richard E. Tracey, K.C.B.; Colonel J. K. Trotter, C.M.G., R.A.; Colonel Charles Moore Watson, R.E., C.B., C.M.G.; *Commander David Wilson-Barker*, R.N.R., Pres. R.M.S., F.R.S.E.

THE ANNUAL DINNER.

The Annual Dinner was held on the evening of the Anniversary, in the Whitehall Rooms, Sir Clements R. Markham, President, in the chair. Among those present were Lord Belhaven and Stenton, Lord Lamington, Mr. Justice Darling, the Dean of Westminster, Sir William Huggins, Field Marshall Sir Henry Norman, Admiral Sir Vesey Hamilton, Sir Harry Johnston, Sir Thomas Holdich, Hon. George C. Brodrick, Admiral Sir Lewis Beaumont, Sir George S. Mackenzie, Dr. Sven Hedin, Mr. Douglas W. Freshfield, Sir Henry Bulwer, the Astronomer Royal, Mr. Pember Reeves, Admiral Sir E. R. Fremantle, Admiral Sir James Bruce, Sir George Whitehouse, Mr. L. W. Longstaff, Prof. Thorpe, Prof. Ray Lankester, Hon. Alfred Dobson, General Shaw Stewart, Mr. R. Chalmers, Hon. W. E. Macartney, Colonel J. K. Trotter, Admiral Sir R. Tracey, Prof. Silvanus P. Thompson, General Sir Henry Smyth, Sir James Hayes Sadler, Mr. Julian Corbett, Mr. Grant Ogilvie, Mr. Alfred Sharpe, Mr. C. H. Read, Major L. Darwin, Mr. J. F. Hughes, Mr. E. L. S. Cocks.

After the toasts of "H.M. the King," Patron, and "H.R.H. the Prince of Wales," Vice-patron, the PRESIDENT proposed the toast of "The Medallists," which was responded to by Mr. DOUGLAS FRESHFIELD and Dr. SVEN HEDIN. The PRESIDENT next proposed "Success to the Antarctic Expedition." Major DARWIN proposed "The Guests," responded to by Sir WILLIAM HUGGINS and Mr. PEMBER REEVES. The toast of "The Staff" was proposed by the PRESIDENT, and responded to by the SECRETARY. Mr. EDMUND GOSSE proposed the toast of "The President and the Society," which was responded to by the PRESIDENT.

Thirteenth Ordinary Meeting, June 8, 1903.—Colonel G. EARL CHURCH, Vice-President, in the Chair.

ELECTIONS:—*Lieut. J. W. M. Ames, 5th Fusiliers; Dr. Ward Brinton; A. H. Whyte Butler, A.M. Inst. C.E.; Rev. H. S. Cronin; Henry Robert Conway Dobbs, I.C.S.; Alastair Macpherson Grant; William James Hoyten, M.R.C.S., L.R.C.P.; Arthur Albert Knight; Surgeon-Capt. John Smith Purdy*, 6th *N.Z.M.R.; Joseph Tucker; W. R. Spencer; Sir George Whitehouse, K.C.B.; Mervyn Williams.*

The Paper read was:—

"Journeys in Mongolia." By C. W. Campbell, C.M.G.

Fourteenth Ordinary Meeting, June 10, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

The Paper read was:—

"The First Year's Work of the National Antarctic Expedition." By the President.

Fifteenth Ordinary Meeting, June 22, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS:—*Gerald James Frederick Adams; Granville Bevan; Herbert Fulford Bush; L. Hope Centeno; Thomas Herbert Davies, B.A.; Arthur Henry Dunning; Dr. P. Dwyer; Frank Flowers; H. S. Holt; J. J. Hubert Humphreys; Captain W. J. Johnston, R.E.; Wilfred Henry Jones, M.A.; Mark Jamestown Kelly; Richard Roope Linthorne; Walter R. Marley; Tyler Morse; William John Radford; Edward Robins, C.E.; Rev. Francis Henry Sprent; Lieut. Francis Maurice Collins Stokes; Albert B. B. de Tscharner; Lieut. W. H. Wilkin.*

The Paper read was:—

"Explorations in Bolivia." By Dr. Evans.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Alps. *G. Abh.* **7** (1903): pp. 52. **Müllner.**

Die Vereisung der österreichischen Alpenseen in den Wintern 1894–5 bis 1900–1. Von Prof. Dr. J. Müllner. *With Diagrams.*

Austria—Danube. *M. k.k. G. Ges. Wien* **46** (1903): 3–11. **Graber.**

Geographisch-Geologisches aus dem oberösterreichischen Donautale. Von H. V. Graber.

Austria—Geodesy.

Publicationen für die Internationale Erdmessung. Die Astronomische-Geodätischen Arbeiten des K. und K. Militär-Geographischen Institutes in Wien. XIX. Band. Astronomische Arbeiten. 7. Polhöhen und Azimuth-Messungen auf den Stationen Ambrožny, Blažkov, Doubrava, Kamejk, Melechau (nur Polhöhe), Mezi vraty, Spálava, Spitzberg, Svidnik, Tok und Volini vrch. Herausgegeben vom K. und K. Militär-Geographischen Institute. Wien, 1902. Size 12 × 9½, pp. vi. and 216.

Austria—Istria. *Vierteljahrs. G. Unterricht* **2** (1903): 138–142. **Krebs.**

Wanderungen aus Istrien: Der Tschitschenboden. Von Dr. N. Krebs.

Balkan Peninsula. *G.Z.* **9** (1903): 149–160. **Philippson.**

Neuere Forschungen in der westlichen Balkanhalbinsel. Von Alfred Philippson.

Belgium—Coal. *Mém. S. Belge Géologie* **16** (1902): 77–120. **Stainier.**

Études sur le bassin houiller du Nord de la Belgique. Par X. Stainier. *With Map.*

Belgium—Manufactures. **Julin.**

Mém. Couronnés Acad. R. Sci. Belgique, Coll. 8°, **63** (1903): pp. 81.

Les Grandes Fabriques en Belgique vers le milieu du XVIII^e^ Siècle (1764). Par Armand Julin.

Belgium—Minerals. *Mém. S. Belge Géologie* **16** (1902): 1–15. **Stainier.**

Description des gîtes métallifères de la Belgique. Par X. Stainier. *With Plans.*

Bulgaria. *Meteorolog. Z.* **20** (1903): 97–107. **Ischirkoff and Kassner.**

Zum Klima von Sofia. I. Einige Notizen über die Lufttemperatur von Sofia. Von Dr. A. Ischirkoff.—II. Ueber den täglichen Gang der Temperatur zu Sofia. Von C. Kassner.—III. 10-Jährige Mittel von Sofia. Von A. Ischirkoff und C. Kassner.

Central Europe. **Ule.**

Niederschlag und Abfluss in Mitteleuropa. Von Prof. Dr. W. Ule. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Vierzehnter Band. Heft 5.) Stuttgart: J. Engelhorn, 1903. Size 9½ × 6½, pp. 435–516.

France—Coasts. *C. Rd.* **136** (1903): 1039–1043. **Depéret.**

Sur les anciennes lignes de rivage pliocènes et quaternaires sur les côtes françaises de la Méditerranée. Note de C. Depéret.

France—Dauphiné. *B.S.G. Lille* **39** (1903): 163–180. **Maquet.**

Le massif de l'Oisans. Par Maurice Maquet.

France—Ports. *B.S. Languedoc. G.* **25** (1902): 351–361, 465–476. **Bouchet.**

Les Ports Français. Par E. Bouchet.

Germany. **Ademeit.**

Beiträge zur Siedlungsgeographie des Unteren Moselgebietes. Von Dr. Wilhelm Ademeit. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Vierzehnter Band, Heft 4.) Stuttgart: J. Engelhorn, 1903. Size 9½ × 6½, pp. 335–434.

See note in Monthly Record (*ante*, p. 79).

Germany—Bavaria. *Jahresb. G. Ges. München* (1901–1902): 87–120. **Reindl.**

Die ehemaligen Weinkulturen in Südbayern. Eine geographisch-kulturgeschichtliche Skizze von Dr. J. Reindl. *With Illustrations.*

Germany—Limnology. *Jahresb. G. Ges. München* (1901–1902): 55–86. **Gebbing.**

Hydrochemische Untersuchungen des Würm-, Kochel- und Walchensees. Von J. Gebbing.

Germany—Mecklenburg. **Kaestner.**

Die Nordöstliche Heide Mecklenburgs nach ihrer geologischen Beschaffenheit und Entstehung. (Mitt. aus der Grossherzoglich Mecklenburg. Geol. Landesanstalt. xiii.) Inaugural-Dissertation von Alexander Kaestner. Rostock, 1901. Size 11½ × 9, pp. 26. *Map and Sections.*

See note in Monthly Record (*ante*, p. 80).

Germany—Prussia. *Petermanns M.* **49** (1903): 64–68. **Braun.**

Der Schilling-See im Preussischen Oberlande. Eine landeskundliche Studie. Von G. Braun. *With Map.*

Germany—Samland. **Jankowsky.**

Samland und Seine Bevölkerung . . . Von Rudolf Jankowsky. Königsberg i. Pr., 1902. Size 9 × 6, pp. 76. *Map.*

See note in Monthly Record (p. 80).

Germany—Thuringia. *Vierteljahrs. G. Unterricht* **2** (1903): 129–138. **Schomers.**

Ein geographischer Ausflug nach Thüringen. Von H. Schomers.

Greece—Euboea. **Geyer.**

Quellen und Forschungen. zur alten Geschichte und Geographie. Heft 6. Topographie und Geschichte der Insel Euboia. I. Bis zum peloponesischen Kriege. Von Fritz Geyer. Berlin: Weidmann, 1903. Size 10 × 6½, pp. 124. *Price* 4*s.*

Holland. *Mém. S. Belge Géologie* **16** (1902): 129–153. **Lorié.**

Le Rhin et le glacier Scandinave quaternaire. Par le Dr. J. Lorié. *With Maps.*

Italy. *Riv. G. Italiana* **10** (1903): 169–179. **Malfatti.**

Sulla necessità di una Geografia dell' Italia medievale. Memoria postuma del Prof. B. Malfatti.

Italy—Bibliography. *Riv. G. Italiana* **9** (1902): pp. 45. **Magistris.**

Bibliografia Geografica della Regione italiana. Anno i. 1901. Rassegna di L. F. De Magistris.

Italy—Florence. **Hyett.**

Florence, Her History and Art, to the Fall of the Republic. By Francis A. Hyett. London: Methuen & Co., 1903. Size 9 × 5½, pp. xxxii. and 600. *Price* 7*s.* 6*d. net. Presented by the Publishers.*

Italy—Hydrology. *Riv. G. Italiana* (1902): 619–630; **10** (1903): 21–44. **Bertolini.**

Ancora della linea delle sorgive in relazione alle lagune e al territorio veneto. Del prof. G. L. Bertolini.

Italy—Rivers and Glaciers. *Riv. G. Italiana* **10** (1903): 146–151. **Marinelli.**

I ghiacciai nel regime dei fiumi alpini secondo una memoria dell' Ing. Gaudenzio Fantoli. O. Marinelli.

See note in Monthly Record (p. 90).

Italy—Terminology. *Riv. G. Italiana* **10** (1903): 45–53. **Crocioni.**

Termini geografici dialettali di Velletri e dintorni raccolti da G. Crocioni.

Italy—Tuscany. *Riv. G. Italiana* **10** (1903): 201–208. **Dainelli.**

Le osservazioni fisiche in Toscana di Pier Antonio Micheli per il Dott. G. Dainelli.

Micheli was born in Florence in 1679, and died in 1737.

Mediterranean—Crete. **Chalikiopoulos.**

Sitia, die Osthalbinsel Kreta's. Eine geographische Studie von Dr. phil. L. Chalikiopoulos. (Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin, Heft 4.) Berlin: E. S. Mittler & Sohn, 1903. Size 10½ × 7, pp. viii. and 138. *Maps and Illustrations. Price* 5*s.*

Mediterranean—Crete. ———

The Cretan Exploration Fund. [Report, 1902.] Size 9½ × 7½, pp. 8. *Sketch-map.*

United Kingdom—Cornwall. **Hull.**

The Cheesewring, Cornwall, and its Teachings. By Prof. Edward Hull, F.R.S., etc. (A Paper read before the Victoria Institute, February 16, 1903.) Size 8½ × 5½, pp. 16. *Illustrations. Presented by the Author.*

The "Cheesewring" is a remarkable pile of rock near Liskeard.

United Kingdom—England. **Milne.**

The Gentleman's Magazine Library: being a Classified Collection of the chief contents of the *Gentleman's Magazine* from 1731 to 1868. Edited by George Laurence Gomme. English Topography. Edited by F. A. Milne. Part x. Shropshire—Somersetshire (pp. xiv. and 350); Part xi. Staffordshire—Suffolk (pp. xiv. and 328); Part xii. Surrey—Sussex (pp. xiv. and 382); Part xiii. Warwickshire—Westmoreland—Wiltshire (pp. xii. and 388); Part xiv. Worcestershire—Yorkshire (pp. xii. and 418). London: E. Stock, 1898–1902. Size 9 × 5½. *Price* 7*s.* 6*d. per vol.*

United Kingdom—Falmouth. **Gay.**

Old Falmouth. The Story of the Town from the days of the Killigrews to the Earliest Part of the 19th Century. By Susan E. Gay. London: Headley Bros., 1903. Size 9 × 5½, pp. xiv. and 260. *Map and Illustrations. Price 7s. 6d.*

United Kingdom—London. *Quarterly Rev.* **197** (1903): 252–269. ———

The Port of London.

United Kingdom—Trade. **Popescu.**

Wirtschaftsgeographische Studien aus Grossbritannien. Von S. D. Popescu. Leipzig: O. Schmidt, 1903. Size 9 × 6, pp. 178. *Presented by the Author.*

United Kingdom—Yorkshire. **Baddeley.**

Thorough Guide Series. Yorkshire (Part i.). The East Coast, York, and the Country between the N.E. Main Line and the Sea; also the Cathedral and Castle of Durham. By M. J. B. Baddeley. Fourth Edition, Revised. London: Dulau & Co., 1902. Size 6½ × 4½, pp. xvi. and 142. *Maps and Plans. Price 2s. 6d. Presented by the Publishers.*

Special attention has been paid in this edition to the requirements of cyclists, and there are additions in other directions also.

ASIA.

Arabia. *Rev. G.* **52** (1903): 123–134, 250–263. **Barré.**

L'Arabie. Par P. Barré. *With Map.*

Caspian Sea. *Meteorolog. Z.* **20** (1903): 54–57. **Woeikof.**

Die Resultate der Karaboghaz-Expedition. Von A. Woeikof.

Ceylon. *Nature* **67** (1903): 620–622. **Herdman.**

The Pearl Fisheries of Ceylon. By Prof. W. A. Herdman, F.R.S.

China. *Army Medical Dept. Rep.* **43** (1901): 381–410. ———

Report on the Medical History of the Campaign, China Field Force, 1900–1901.

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West Coast of Cape York Peninsula and Horn Island and Possession Island Goldfields. By C. F. V. Jackson. *Map and Illustrations.*

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Arctic—"Polar Star." **Abruzzi, Cagni, Molinelli, and Le Queux.**
On the *Polar Star* in the Arctic Sea. By His Royal Highness Luigi Amedeo of Savoy, Duke of the Abruzzi, with the statements of Commander M. Cagni upon

the Sledge Expedition to 86° 34′ North, and of Dr. A. Cavalli Molinelli upon his return to the Bay of Teplitz. Translated by William Le Queux. In Two Volumes. London: Hutchinson & Co., 1903. Size 10 × 7½, pp. xvi. 702, and xii. *Price* 42*s. net. Presented by the Publishers.*

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Geodesy. **Albrecht.**

Centralbureau der Internationalen Erdmessung. Neue Folge der veröffentlichungen, No. 8. Resultate des Internationalen Breitendienstes. Band i. Von Th. Albrecht. Berlin: G. Reimer, 1903. Size 11½ × 9, pp. 174. *Maps, Plans, and Plates.*

Geodesy—Instruments. *Sci. T.R. Dublin S.* **7** (Ser. ii.) (1902): 385–390. **Grubb**

Some new forms of Geodetical Instruments. By Sir Howard Grubb. *Plate.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Hann and Ward.**

Handbook of Climatology. By Dr. Julius Hann. Translated with the Author's permission from the Second Revised and Enlarged German Edition, with additional references and notes, by Robert de Courcy Ward. New York and London: Macmillan & Co., 1903. Size 9½ × 6, pp. xiv. and 438. *Diagrams. Price* 12*s.* 6*d. net. Presented by the Publishers.* [See review, *ante*, p. 75.]

Coral Reefs. *P.R.S.* **71** (1903): 412–414. **Agassiz.**

On the Formation of Barrier Reefs and of the Different Types of Atolls. By A. Agassiz.

See note in the Monthly Record (p. 89).

Crust of the Earth. *B.S. Belge Géologie* **16** (1902): 594–602. **Van den Broeck.**

Quelques remarques à propos des vues de M. le Dr. A. Stübel sur la genèse et la structure de l'écorce solide du globe et des conséquences géologiques de cette thèse. Par E. Van den Broeck.

Geology—Bibliography.

International Catalogue of Scientific Literature. First Annual Issue. H. Geology. Published for the International Council by the Royal Society of London. London: Harrison & Sons, 1903. Size 9 × 5½, pp. xiv. and 220. *Price* 15*s.*

Glacial Epoch. *Naturw. Wochenschrift* **2** (1903): 301–305. **Wolff.**

Zur Kritik der Interglacial-Hypothese. Von Dr. W. Wolff.

Glaciers. **Finsterwalder and Muret.**

Commission Internationale des Glaciers. Les Variations Périodiques des Glaciers. Septième Rapport, 1901, rédigé par le Dr. Finsterwalder et E. Muret. (Extrait des Archives des Sciences physique et naturelles, t. xiv., 1902.) Geneva, 1902. Size 9 × 6, pp. 21.

Glaciers. *Jahresb. G. Ges. München* **(1901–1902)**: 41–54. **Günther.**

Pencks neue Glazialstudien. Von S. Günther.

Gravity. *C. Rd.* **136** (1903): 705–707. **Ballore.**

Sur les anomalies de la pesanteur dans certaines régions instables. Note de F. de Montessus de Ballore.

Hydrology. *C. Rd.* **136** (1903): 572–574. **Martel.**

Sur l'enfouissement des eaux souterraines et la disparition des sources. Note de E.-A. Martel.

Hydrology. *C. Rd.* **136** (1903): 910-912. **Fournier and Magnin.**
Sur la vitesse d'écoulement des eaux souterraines. Note de E. Fournier et A. Magnin.

Hydrology. *B.S. Belge Géologie* **16** (1902): 166-169. **Jérôme.**
Exemple de la solution de menus problèmes d'Hydrologie, par le procédé de la coloration des eaux à l'aide de la fluorescéine. Par A. Jérôme.

Hydrology. *B.S. Belge Géologie* **16** (1902): 648-650. **Moulan.**
Note sur les venues d'eau dans les calcaires. Par T. Moulan.

Oceanography. *P.R.S. Edinburgh* **23** (1899-1901): 35-43. **Manley.**
The Examination of Sea-Water by an Optical Method. By J. J. Manley.

Oceanography. **Thoulet.**
Résultats des Campagnes Scientifiques accomplies sur son yacht par Albert Ier Prince Souverain de Monaco, publiés . . . avec le concours de Jules Richard. Fascicule xxii. Echantillons d'eaux et de fonds provenant des campagnes de la *Princesse-Alice* (1901). Par J. Thoulet. Imprimerie de Monaco, 1902. Size 14 × 11½, pp. 76. *Plates.*

Oceanography. *Z. Ges. Erdk. Berlin* (1903): 220. **Woeikof.**
Das Warmwasser vor den Strassen von Gibraltar und Bab-el-Mandeb. Von Prof. Dr. A. Woeikof.

Oceanography—Atlantic. *Ann. Hydrographiques* (1902): 160-166. ———
Résultats d'expériences sur les courants au large d'Ouessant et du Cap Finisterre et à l'entrée du détroit de Gibraltar.

Oceanography—Atlantic. *Ann. G.* **12** (1903): 13-18. **d'Almeida.**
Deux nouvelles cartes mensuelles de l'Atlantique du Nord. Par P. Camena d'Almeida. *Also separate copy.*

Oceanography—Currents. **Sandström and Helland-Hansen.**
Ueber die Berechnung von Meeresströmungen. Von J. W. Sandström und B. Helland-Hansen. (Report on Norwegian Fishery- and Marine-Investigations, vol. ii., 1902, No. 4.) Bergen, 1903. Size 10 × 7, pp. 43. *Diagram.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Cannibalism. *Ges. Völker- u. Erdk. Stettin, Bericht* (1901-1902): 19-22. **Sokolowsky.**
Kannibalismus. Von Dr. A. Sokolowsky.

Climate and Railways. *J.G.* **2** (1903): 178-190. **Brown.**
Climatic Factors in Railroad Construction and Operation. By R. M. Brown.

Commercial—Ginseng. *J.G.* **2** (1903): 26-31. **Carney.**
The Domestication of Ginseng. By F. Carney. *With Illustrations.*

Commercial—Ivory. *Mouvement G.* **20** (1903): 183-185, 191-194, 204-206. **Van Baer.**
L'Ivoire. Par R. Van Baer.

Historical—Apianus. **Ortroy.**
Bibliographie de l'œuvre de Pierre Apian. Par F. Van Ortroy. (Extrait du *Bibliographe moderne*, mars-octobre 1901.) Besançon, 1902. Size 10 × 6½, pp. 120. *Presented by the Author.*

Historical—Cartography. *Riv. G. Italiana* **9** (1902): 643-644. **Errera.**
Un particolare notevole in una Carta nautica del secolo xv. C. Errera.
On a legend showing the influence of Battista Beccario on the maps of Roselli.

Historical—Molanus. **Ortroy.**
Lettres de Jean Molanus (Van der Molen) à Gérard et à Barthélemy Mercator. Par F. Van Ortroy. Bruxelles: Kiessling et Cie., 1901. Size 9 × 6, pp. 72. *Presented by the Author.*

Historical—Toscanelli and Columbus. **Vignaud.**
Toscanelli and Columbus. Letters to Sir Clements R. Markham, C.B., etc., and to C. Raymond Beazley. With an Introductory Note and the Bibliography of this Controversy. London: Sands & Co., 1903. Size 9 × 5½, pp. 32. *Presented by the Author.*

GENERAL.

British Colonies. *Nineteenth Century* **53** (1903): 670–677. **Dyer.**
Corn-growing in British Countries. By E. J. Dyer.

British Empire—Census. *J.R. Statistical S.* **66** (1903): 31–70. **Baines.**
A Census of the Empire. By J. A. Baines.

Comparative Geography. *Rev. G.* **52** (1903): 345–353. **Deschamps.**
Archipels d'Amérique et d'Asie, Essai de Géographie comparative. Par Dr. L. Deschamps. *With Map.*

Education. *J.G.* **2** (1903): 83–95. ———
The Course of Study in Geography and Nature Study at the Speyer School, Teacher's College, Columbia University.

Educational—Exhibition. ———
Katalog der Ausstellung neuerer Lehr- u. Anschauungsmittel für den Unterricht an Mittelschulen, K. K. Österreichisches Museum für Kunst u. Industrie in Wien. Wien: C. Fromme, 1903. Size 9 × 6, pp. xii. and 160. *Presented by Dr. K. Peucker.*

Medical Geography. **Clemow.**
The Geography of Disease. By Frank G. Clemow. Cambridge: The University Press, 1903. Size 8 × 5½, pp. xiv. and 624. *Maps. Price* 15*s. Presented by the Syndics of the Cambridge University Press.*

Medical Geography. **Manson.**
Tropical Diseases. A Manual of the Diseases of Warm Climates. By Patrick Manson. New and Revised Edition. London, etc.: Cassell & Co., 1903. Size 7½ × 4½, pp. xvii. and 756. *Plates and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Medical Geography—Malaria. *Popular Sci. Monthly* **62** (1903): 521–525. **Herrick.**
The Relation of Malaria to Agriculture and other Industries of the South. By Prof. G. W. Herrick.

Medical Geography—Malaria. *Climate* **4** (1903): 221–235. **Sambon.**
Malaria. By Dr. L. W. Sambon. *With Illustrations.*

Medical Geography—Tsetse-fly Disease. **Broden.**
B.S. d'Études Colon. **10** (1903): 225–227.
Le surra ou "maladie de la tsetsé" chez les bœufs, à Léopoldville. *With Illustrations.*

Spanish Grammar. **Weintz.**
The Spanish Principia.—Part i. A First Spanish Course. Containing Grammar, Delectus, and Exercise Book, with Vocabularies. By H. J. Weintz. London: J. Murray, 1903. Size 7½ × 4½, pp. x. and 180. *Price* 3*s.* 6*d. Presented by the Publisher.*

Travel. **Cockerell.**
Travels in Southern Europe and the Levant, 1810–1817. The Journal of C. R. Cockerell, R.A. Edited by his Son, Samuel Pepys Cockerell. London, etc.: Longmans, Green & Co., 1903. Size 9½ × 6, pp. xii. and 286. *Portrait. Price* 10*s.* 6*d. net. Presented by the Publishers.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

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England and Wales. **Ordnance Survey.**
ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from May 1 to 31, 1903

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England and Wales. **Geological Survey.**

One-inch scale, new series, colour printed. Leicester, sheet 156 (Drift edition), with explanation. 1*s.* 6*d.*

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Leicester, Geology of the Country near (explanation of sheet 156). 3*s.*

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England and Wales. **Bartholomew.**

The Survey Atlas of England and Wales. A series of eighty-four plates of maps and plans, with Descriptive Text, illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed by and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S. Parts 5 and 6. Edinburgh: John Bartholomew & Co., 1903. *Presented by the Publishers. Price* 2*s.* 6*d. each part.*

Part v. contains the following sections of the ½-inch map: No. 40, Brecon and Builth; 41, Cardigan; 42, Milford Haven; 43, Swansea and Carmarthen. In addition to these, this part also includes the dedication and contents of text. Part vi. contains: section 21, Cromer and the Broads; 22, The Wash; 44, Cardiff and Merthyr; 45, Bristol and Monmouth. As part vi. is issued with part v. in June, there will be no part published in July.

Liverpool Bay. **Belam and Ashton.**

Chart of Liverpool Bay. Surveyed by the Marine Surveyor of the Mersey Docks and Harbour Board, 1902. Scale 1000 yards to an inch. Henry Belam, Com-

mander, R.N., Marine Surveyor; H. G. G. Ashton, F.R.G.S., Assistant Marine Surveyor. *Presented by H. G. G. Ashton, Esq.*

New edition, showing alterations in sandbanks and soundings.

ASIA.

Asia Minor. **Kiepert.**

Karte von Kleinasien. Scale 1 : 400,000 or 6·3 stat. miles to an inch. Von Dr. Richard Kiepert. Sheets: CV., Malatia, and DV., Haleb. Berlin: Dietrich Reimer (Ernst Vohsen), 1902. *Price 6 marks.*

British North Borneo. **British North Borneo Company.**

A Map of British North Borneo. Compiled from the English Admiralty Charts, and from the Surveys and Explorations of Messrs. F. Witti, W. B. Pryer, F. Hatton, Henry Walker, D. D. Daly, and R. D. Beeston, in the service of the British North Borneo Company. Scale 1 : 633,600 or 10 stat. miles to an inch. 2 sheets. London: Edward Stanford, 1903. *Price 2s. 6d.*

A good general map of British North Borneo, showing the present state of our knowledge of the country. Soundings are given round the coast, and the map is divided into two minute squares. Land sold to subsidiary companies and others is indicated. In addition to British North Borneo, the map also includes the adjacent portions of Brunei and Sarawak.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 21 N.E., parts of Udaipur, Jodhpur, and Sirohi (Rajputana Agency), and of Idar, Danta, and Palanpur, Native States (Bombay Presidency), additions to 1897. 35 N.E., parts of Native States of Gwalior and Indore (C.I. Agency), and of Udaipur, Tonk, Bundi, and Jhalawar (Rajputana Agency), additions to 1901. 35 S.E., parts of Native States of Udaipur, Jhalawar, Partabgarh, and Banswara (Rajputana), and of Gwalior, Indore, and Western Malwa Agencies (Central India), corrections to 1899, 1900. 38 S.E., parts of districts Aurangabad and Bid (Nizam's Dominions), Ahmednagar and Nasik (Bombay Presidency), additions to 1900, 1901. 71 N.E., parts of districts Jubbulpore, Damoh, Mandla, and Narsinghpur (Central Provinces), and of Rewah (C.I. Agency), additions to 1901, 1902. 105 N.E., parts of districts Palamau, Ranchi, and Singhbhum, and of Jashpur State (Chota Nagpur), Bengal, additions to 1896. 125 S.E., parts of districts Sylhet, Cachar, and North Lushai Hills (Assam), and Native State of Hill Tippera (Bengal), additions to 1899. 130 S.E., parts of districts Naga hills, Manipur Native State, and of Naga tribes (Assam), additions to 1894.—India, 64 miles to an inch, 4 sheets.—Railway System of India, 80 miles to an inch, corrected up to April 30, 1902.—Province of Assam, 16 miles to an inch, 2 sheets, 1902.—Assam Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 61, districts Darrang and Nowgong, Seasons 1887–88, 1891–92, and 1897–98, 1902; 165, district Lushai Hills, Season 1899–1901, 1902.—Bengal Survey, 1 mile to an inch. Sheets: 127, parts of districts Ranchi and Singhbhum and Ganpur State, Season 1862–63, 1902; 128, parts of district Singhbhum and States of Gangpur and Bonai, Season 1860–62, 1902; (Preliminary Edition) 141, 144, 145, district Mazaffarpur, Season 1895–96, 1901.—Lower Provinces, Bengal, district Ranchi, 4 miles to an inch, additions and corrections up to October, 1901, 1902.—Bombay Survey, 1 mile to an inch. Sheets: 183, parts of Panchi Mahalo District and States of Baroda, Chhota Udeypur, and Bariya, Seasons 1883–84 and 1890–91, corrected up to February, 1898, 1901; 206, parts of Ratnagiri District, and Kolhapur and Southern Maratha Agency, Season 1892–93, additions and corrections up to March, 1902.—Burma Survey, 1 mile to an inch. Sheets: 247 (New Series), parts of districts Meiktila, Yamethin, and Southern Shan States, Seasons 1890–91 and 1898–1901, 1902; 288 (307 Old Series), parts of districts Mandalay, Kyaukse, Northern and Southern Shan States, Seasons 1895–97, 1902; (Preliminary Edition) 289 (New Series), Northern and Southern Shan States, and districts Mandalay and Kyaukse, Season 1899–1900, 1901; 431 (New Series), part of Northern Shan States, Season 1900–01, 1902; (Preliminary Edition) 434 (New Series), part of South Hsenwi State, Season 1899–1900, 1901; 439 and 508 (New Series), parts of Southern Shan States, Seasons 1897–98 and 1900–01, 1902; 507 (New Series), parts of Northern and Southern Shan States, Season 1900–01, 1902.—Upper Burma, 16 miles to an inch; (Third Edition) 2 sheets, 1902.—North-Eastern Frontier, 4 miles to an inch. Sheets: (Fourth Edition) 23 S.E., Burma and China (Yun-nan Province), Seasons 1894–95 and 1897–1900, 1902; 28 S.E., S.W., 29 N.E., N.W., S.E., 30 S.E., 37 N.E., 44 N.W., S.W.; China, Ssu-chuan Provinces, Season 1899–1900, 1902; 29 S.W., 30 S.W., 39 S.W., China, Yun-nan and Ssu-chuan Provinces, Season 1899–1900, 1902; China,

Yun-nan Province, Season 1898–1900, 1902; 38 N.W., China, Ssu-chuan and Kuei-Chou Provinces, Season 1898–99, 1902; 38 S.W., China, Yun-nan and Kuei-Chou Provinces, Season 1898–99, 1902; 44 N.E., China, Hu-Pei Province, Season 1898–99, 1902; 44 S.E., China, Hu-Pei and Hu-nan Provinces, Season 1898–99, 1902.—South Eastern Frontier, 4 miles to an inch. Sheets: 12 N.E. and N.W., China, Yunnan Province, Season 1898–1900, 1902.—Central Provinces, District Betul, 8 miles to an inch, 1902.—Hyderabad Assigned Districts, District Amraoti, 8 miles to an inch, 1902.—United Provinces of Agra and Oudh, district Pilibhit, 8 miles to an inch, corrected up to 1901, 1902.—Chart of Triangulation and Traverse, No. 20 Party (Burma Forest), 2 miles to an inch. Sheets: 254 and 256 (Burma), New Series, Seasons 1890–95, 1902.—China Field Force Survey, 2 miles to an inch. Sheets: 1–9, 12, 13, 15–21, China (Chih-Li Province), Season 1900–01, 1902.—Central India and Rajputana Survey, 1 mile to inch. Sheet 228 (Second Edition), parts of States Jaipur, Jodhpur and Kishangarh (Rajputana Agency), Seasons 1865–66 and 1867, additions and corrections to July, 1882, 1902. *Presented by H.M. Secretary of State for India, through the India Office.*

Peking and Tientsin. **Königl. Preuss. Landes-Aufnahme.**

Plans of Peking, scale 1: 17,500 or 3·5 inches to 1 stat. mile; Gesandtschafts-viertel in Peking, scale 1: 3000 or 21·12 inches to 1 stat. mile; Tientsin, scale 1: 25,000 or 2·5 inches to 1 stat. mile. Aufgenommen 1900–1901 von den Feld-topographen des Deutschen Ostasiatischen Expeditions-Korps. Herausgegeben von der Kartographischen Abtheilung der Königl. Preuss. Landes-Aufnahme 1903.

AFRICA.

Central Africa. **Universities' Mission to Central Africa.**

The Universities' Mission to Central Africa Atlas, with descriptive letterpress by members of the staff of the Mission and others, and a preface by Sir H. H. Johnston. London: Offices of the Universities' Mission to Central Africa, 1903. *Price 2s. 6d. net. Presented by the Secretary of the Universities' Mission to Central Africa.*

An atlas of eight sheets of maps and plans, with descriptive letterpress, showing the stations and spheres of operations of the universities' mission in Central Africa. The maps and plans, which have been prepared by Messrs. Bartholomew, are clear and good, and the fact that the text is by members of the mission staff personally acquainted with the special districts they describe adds considerably to its interest.

Congo State and North-West Rhodesia. **Grey.**

Tanganyika Concessions, Ltd. Mr. George Grey's Maps showing Exploration and Discoveries to September 30, 1902. Scales 1: 506,880 or 8 stat. miles to an inch and 1: 1,000,000 or 15·7 stat. miles to an inch. London: Edward Stanford, 1903.

These maps include the regions of North-West Rhodesia and the Congo Free State to the west of Lakes Bangweulu and Mweru and north of lat. 13° S. They are based upon recent route surveys and explorations, and although no pretence has been made at great accuracy, they fill in a considerable area that has hitherto been very imperfectly known. The maps must only be considered as provisional, and members of Mr. Grey's expedition are now making a more complete survey of the region.

German East Africa. **Sprigade and Moisel.**

Karte von Deutsch-Ostafrika. Scale 1: 300,000 or 4·7 stat. miles to an inch. Begonnen unter Leitung von Dr. Richard Kiepert; fortgesetzt unter Leitung von Paul Sprigade und Max Moisel. Sheet E 5, Kissaki. Berlin: D. Reimer (E. Vohsen), 1902.

Transvaal. **de Hora.**

Mining and Geological Map of the Witwatersrand Goldfields. Compiled from authentic information and actual survey. By M. H. de Hora, C.E., M.E. July, 1902. 9 sheets. London: G. Philip & Son. *Price, unmounted in sheets, with index,* 21*s.*

A considerable amount of detailed information is given on this map concerning mining properties, water-supply, direction of reefs, and other similar matters connected with the Witwatersrand Goldfields. It is accompanied by an index to names.

Tunis. **Service Géographique de l'Armée, Paris.**

Tunisie. Scale 1:50,000 or 0·78 stat. mile to an inch. Sheet No. lxiii., Kairouan. Paris: Service Géographique de l'Armée. *Price* 1.50 *fr.*

AMERICA.

California. **Kelsey and Manson.**

Map of the State of California showing the Three Principal Factors in the Water-Supply. Scale 1 : 760,320 or 12 stat. miles to an inch. Compiled for the California Water and Forest Association by Fletcher F. S. Kelsey, directed by Marsden Manson, C.E. September, 1900. *Presented by Marsden Manson, Esq.*, C.E.

This map shows the areas of the principal watersheds by red lines, with figures giving the square miles in each, the mean annual rainfall in inches, and the timber and brush-covered areas and forest reserve boundaries. Altogether the map is interesting and instructive in connection with the physical geography and water-supply of California. The data upon which it is based has been obtained from the most reliable sources, that for the drainage areas having been furnished by the State Engineering Department, the rainfall from the U.S. Weather Bureau, records of J. B. Lippincott, C.E. (Resident Hydrographer, U.S. Geological Survey), and the State Engineering Department; while the reports and maps of the California State Board of Forestry, 1886 and 1888, and the U.S. Geological Survey of 1898, have furnished the data for the forest and brush areas.

Canada. **Surveyor-General of Canada.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Emerson Sheet (1), East of Principal Meridian. Revised to February 25, 1903. Lake of the Woods Sheet (1A), East of Principal Meridian. Revised to April 14, 1903. Cross Lake Sheet (2A), East of Principal Meridian. Revised to April 1, 1903. Dufferin Sheet (9), West of Principal Meridian. Revised to September 3, 1902. Armit Sheet (30), West of Principal Meridian. Revised to April 11, 1903. Red Deer Forks Sheet (59), West of Third Meridian. Revised to March 31, 1903. Ottawa: Surveyor-General's Office, 1903. *Presented by the Surveyor-General of Canada.*

Manitoba. **Department of the Interior, Canada.**

Manitoba. Scale 1 : 792,000 or 12·5 stat. miles to an inch. Ottawa: Department of the Interior. *Presented by the Department of the Interior, Canada.*

GENERAL.

Eastern Empires. **Grundy.**

Murray's Handy Classical Maps. The Eastern Empires. Edited by G. B. Grundy, M.A., of Brasenose College, Oxford. London: John Murray. *Price* 1*s.* *Presented by the Publisher.*

This sheet contains two maps, the first of which, on the scale of 1 : 12,000,000, is orographically coloured, and shows the empire of Alexander the Great; whilst the second, which includes a slightly larger area (on the scale of 1 : 14,400,000), represents, by different tints, the empires of the Babylonians, Lydians, Medes, and Persians. Like others of this useful series, the maps are accompanied by an index of place-names.

World. **Lehmann and Scobel.**

Atlas für höhere Lehranstalten mit besonderer Berücksichtigung der Handelsgeographie. Bearbeitet und herausgegeben von Dr. R. Lehmann und A. Scobel. Bielefeld und Leipzig: Velhagen & Klasing, 1903.

Although it is not so stated, this atlas may be considered as a new edition of that brought out in 1897 under the superintendence of Dr. R. Lehmann and Dr. W. Petzold. It contains eighty sheets of maps, plans, and diagrams, clearly drawn and printed in colours, dealing with physical geography, meteorology, vegetation, population, and fauna, in addition to those showing political divisions.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich. 17 & 18 Lieferung. Gotha: Justus Perthes. *Price* 60 *pf. each part.*

Contains the four following maps: Nos. 17 and 18, Österreich-Ungarn, Bl. 1 u. 2, 1 : 1,500,000, von C. Vogel. No. 38, Grossbritannien, Südl. Blatt., 1 : 1,500,000, von O. Koffmahn. No. 58, Ost-Sibirien, 1 : 7,500,000, von H. Habenicht. The two last are new maps, while the others are revised editions.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during March and April, 1903. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3353 to 3364		Tidal streams, Channel islands. Each 4*d*. The same twelve charts bound together in an Atlas. 5*s*.
3315	m = 1·30	England, south coast :—Straight point to Portland. 3*s*. 6*d*.
3302	m = 6·9	Scotland, west coast :—Narrows of Raasay and Caol More. 2*s*. 6*d*.
3331	m = 6·88 / 3·4	Scotland. Hebrides, west coast :—Flannan isles or Seven Hunters, Sulisker, North Rona. 1*s*. 6*d*.
3319	m = 0·78	North American lakes. Lake Huron :—Goderich to Chantry island. 2*s*. 6*d*.
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395	m = 1·3 / 4·2	Africa, west coast :—Isles de Los, Konakri road.
3347	m = 5·28	Japan :—Plans on the north coast of Nipon. 1*s*. 6*d*.
2035	m = 1·99	New Zealand, north island :—Coromandel harbour. 1*s*. 6*d*.
3338	m = 1·6	Pacific ocean. Gilbert island :—South part of Nonuti. 1*s*. 6*d*.
2221		Black sea. Plans of Russian ports on the north shore. Plan added :—Gagri anchorage.
2220		Black sea. Ports and anchorages on the south shore. Plan added :—Kerasunda.
1535		Plans on the east coast of Iceland. Plan added :—Horne fiord entrance.
1806		Africa, west coast. Great Fish bay to Walfisch bay. Plan added :—Swakopmund road.
2662		Celebes. Ports in Makassa strait. New Plans :—Majene road and Balangnipa road.
3209		Celebes. Bays and anchorages in Makassar strait. Plan added :—Mampya road.
769		Admiralty and Hermit islands. Plan added :—Carola bay. New plan :—Hermit islands.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2035	Coromandel harbour.	New chart.	
3269	Nonuti, south-west anchorage; plan on this sheet.	New plan.	
		Coromandel harbour	2035
		South part of Nonuti	3338

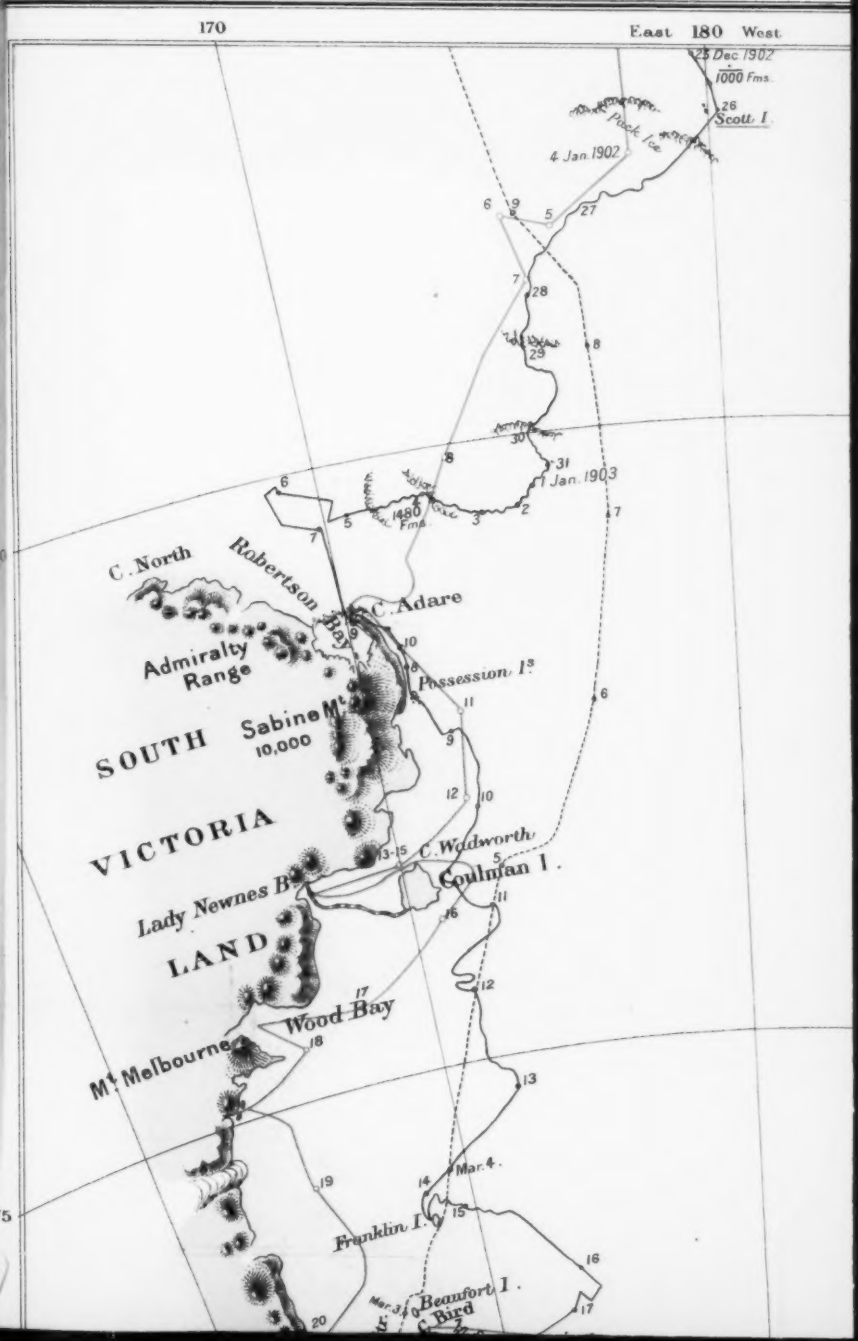
Charts that have received Important Corrections.

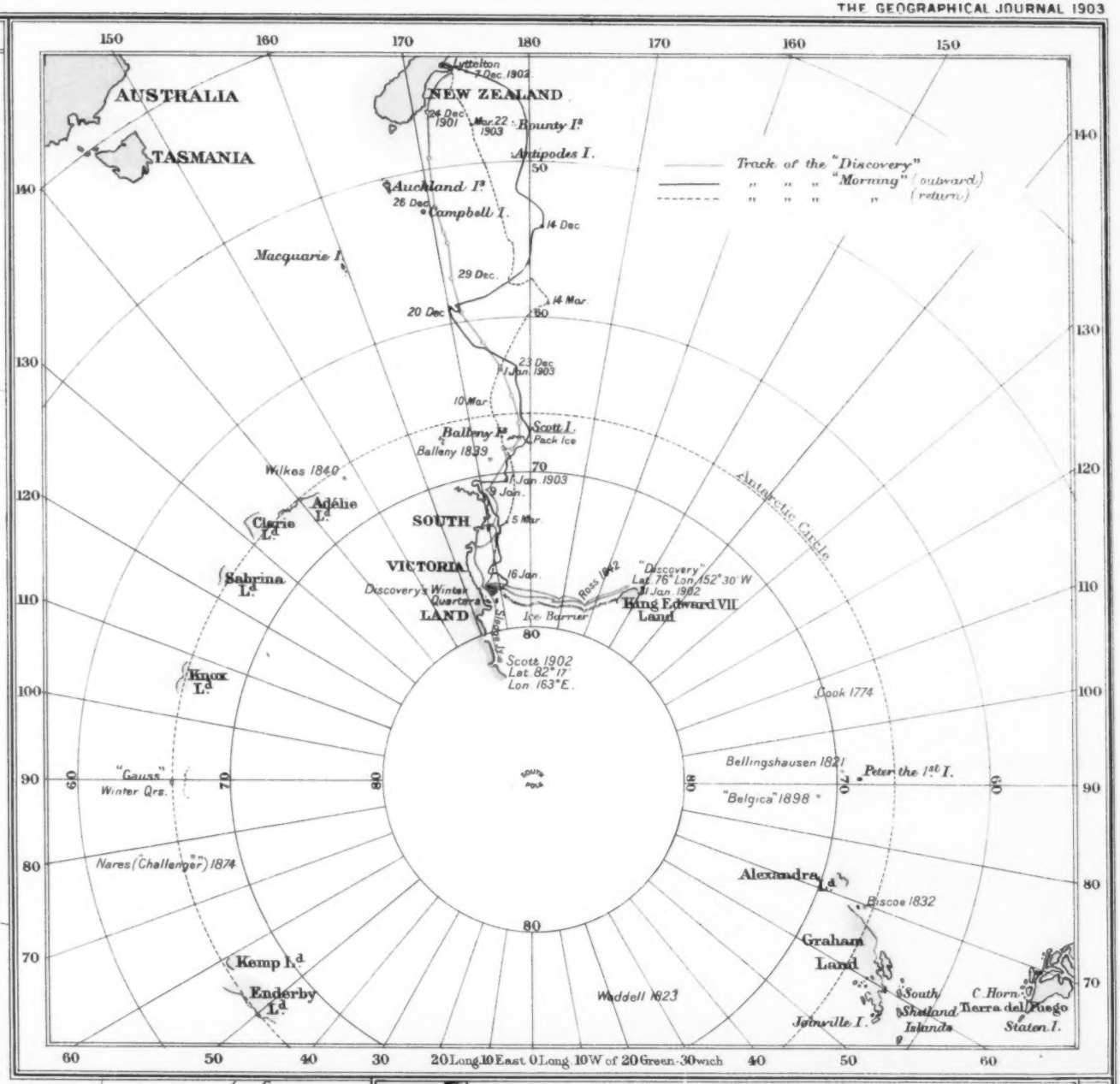
No. 1610, England :—North Foreland to Orfordness. 2966, Lapland :—Port Ekaterininskoi and Pala bay. 2280, White sea :—Arkhangel bay. 2366, Germany :—north coast :—Sheet II. :—Arkona to Dievenow river. 2369, Germany, north coast :—Rixhöft to Bruster-ort. 88, Spain, north coast :—Plans :—San Sebastian, entrance of San Martin de la Arena. 1130, Sardinia :—Cagliari bay. 1550, Iceland :—Reydar and Faskrud fiords. 414, West Indies :—Cuba, Havana harbour. 2677, West Indies, Leeward islands :—Culebra or Passage islands. 804, West Indies, Leeward islands :—Approaches to Pointe à Pitre, etc. 3107, South America, east coast :—Cape St. Thomé to Guaratiba point. 2837B, Persian gulf, northern portion. 2760, Sumatra, Sheet I. :—Acheh head to Tyingkok bay. 2201, Sumatra :—Plans in. 709, Sumatra, west coast :—Ujong Masang to Ujong Indrapura. 941B, Eastern archipelago, western portion, sheet 2. 942A, Eastern archipelago, eastern portion, sheet 1. 934, Eastern archipelago :—Surabaya, Bali, and Sapudi straits. 2636, Philippine islands :—Strait of Makassar, north part. 389, China, north-east coast :—Shanghai harbour. 1236, China, north coast :—Port Arthur. 2657, Japan :—Gulf of Tokyo. 2388, Russian Tartary :—Sea of Okhotsk. 1750, Australia, south coast :—Port Adelaide. 2130, Tasmania :—Port Davey. 3269, Pacific ocean, Gilbert islands :—Tarawa lagoon. 968, Pacific ocean, Ellice islands :—Mua and Mata Utiu anchorage.

(*J. D. Potter, Agent.*)

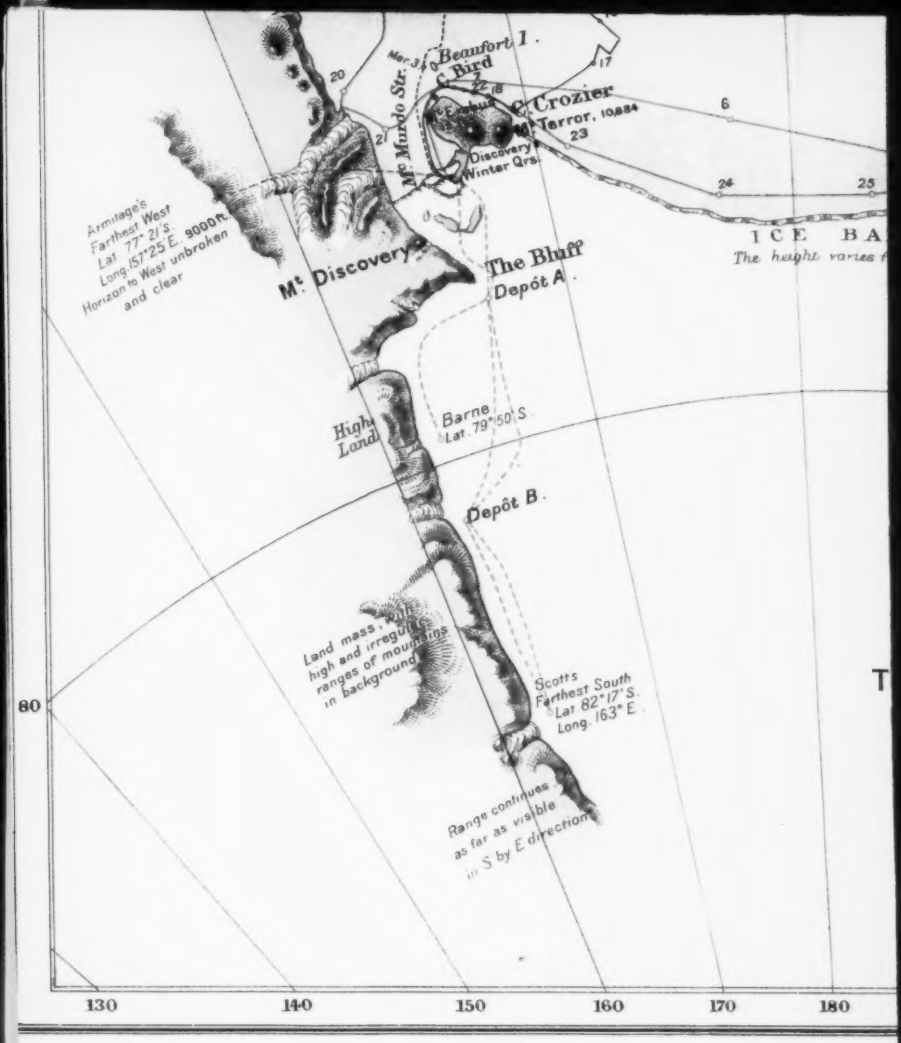
North Atlantic Ocean and Mediterranean Sea. **Meteorological Office.**

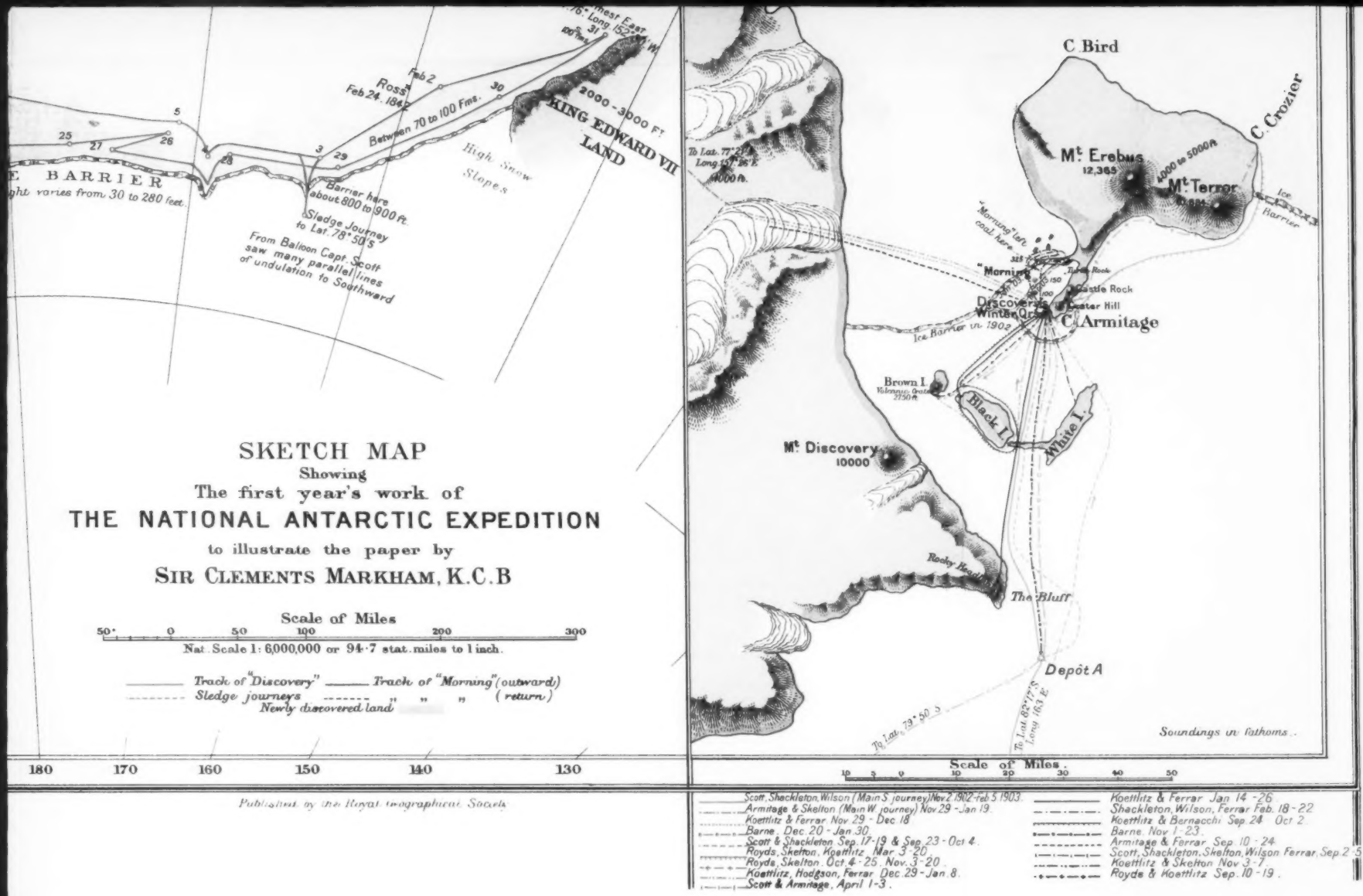
Pilot Chart of the North Atlantic and Mediterranean for June, 1903. London : Meteorological Office. *Price* 6*d*. *Presented by the Meteorological Office, London.*


170
East 180 West
25 Dec 1902
1000 Fms.
Scott I.
Pack Ice
4 Jan 1902
1 Jan 1903
1480 Fms.
C. North
Robertson Bay
C. Adare
Admiralty Range
Possession Is.
SOUTH VICTORIA LAND
Sabine Mt. 10,000
C. Wadworth
Coulman I.
Lady Newnes B.
Wood Bay
Mt. Melbourne
Franklin I.
Beaufort I.
C. Bird
Mar. 4
Mar. 3
70
75


AUSTRALIA
TASMANIA
NEW ZEALAND
Lyttelton 7 Dec. 1902
24 Dec. 1901
Mar. 22 1903
Bounty Is.
Antipodes I.
Auckland Is.
26 Dec.
Campbell I.
14 Dec.
Macquarie I.
29 Dec.
14 Mar.
20 Dec.
23 Dec.
1 Jan. 1903
10 Mar.
Balleny Is.
Balleny 1839
Scott I.
Pack Ice
Wilkes 1840
1 Jan. 1903
9 Jan.
5 Mar.
Adélie L.d
Clarie L.d
SOUTH VICTORIA LAND
Sabrina L.d
16 Jan.
Discovery's Winter Quarters
Ross 1842
"Discovery" Lat. 76° Lon. 152° 30' W 31 Jan. 1902
King Edward VII Land
Ice Barrier
Scott 1902 Lat. 82° 17' Lon. 163° E.
Knox L.d
Cook 1774
Bellingshausen 1821
Peter the 1st I.
"Belgica" 1898
"Gauss" Winter Qrs.
Nares ("Challenger") 1874
Alexandra L.d
Biscoe 1832
Graham Land
Kemp L.d
Enderby L.d
Weddell 1823
Joinville I.
South Shetland Islands
C. Horn
Tierra del Fuego
Staten I.
Track of the "Discovery"
" " " "Morning" (outward)
" " " " (return)
Antarctic Circle
SOUTH POLE
Long. 10 East 0 Long. 10 W of 20 Green-30wich

Farthest East Lat. 76° Long. 152° 31' W 100 Miles
C. Bird


Beaufort I.
C. Bird
Mc Murdo Str.
C. Crozier
Terror, 10,884
Discovery's Winter Qrs.
ICE BA
The height varies
Armitage's Farthest West Lat. 77°21'S. Long. 157°25'E. 9000ft. Horizon to West unbroken and clear
Mt. Discovery
The Bluff
Depôt A.
High Land
Barne Lat. 79°50'S.
Depôt B.
Land mass, hills high and irregular, ranges of mountains in background
Scotts Farthest South Lat. 82°17'S. Long. 163°E.
Range continues as far as visible S by E direction
80
130
140
150
160
170
180


Ross
Feb 24. 1842
Feb 2
Between 70 to 100 Fms.
30
5
25
27
26
28
3
29
31
2000 - 3000 Ft.
KING EDWARD VII LAND
High Snow Slopes
E BARRIER
ght varies from 30 to 280 feet.
Barrier here about 800 to 900 ft.
Sledge Journey to Lat. 78°50'S
From Balloon Capt. Scott saw many parallel lines of undulation to Southward
SKETCH MAP
Showing
The first year's work of
THE NATIONAL ANTARCTIC EXPEDITION
to illustrate the paper by
SIR CLEMENTS MARKHAM, K.C.B
Scale of Miles
50 0 50 100 200 300
Nat. Scale 1: 6,000,000 or 94·7 stat. miles to 1 inch.
Track of "Discovery"
Track of "Morning" (outward)
Sledge journeys
" " " (return)
Newly discovered land
180 170 160 150 140 130
C. Bird
C. Crozier
Mt. Erebus
12,365
4000 to 5000 ft
Mt. Terror
Ice Barrier
"Morning" left coal here
"Morning"
Discovery Winter Qrs.
Castle Rock
Lester Hill
C. Armitage
Ice Barrier in 1902
Brown I.
Black I.
White I.
Mt. Discovery
10000
Rocky Headland
The Bluff
Depôt A
To Lat. 79°50'S
To Lat 82°17'S Long 163°E
Soundings in fathoms.
Scale of Miles
10 5 0 10 20 30 40 50
Scott, Shackleton, Wilson (Main S. journey) Nov 2. 1902-Feb 3. 1903.
Armitage & Skelton (Main W. journey) Nov 29 - Jan 19.
Koettlitz & Ferrar Nov 29 - Dec 18
Barne. Dec 20 - Jan 30.
Scott & Shackleton Sep. 17-19 & Sep. 23 - Oct 4.
Royds, Skelton, Koettlitz Mar 3 - 20.
Royds, Skelton Oct 4 - 25. Nov. 3 - 20
Koettlitz, Hodgson, Ferrar Dec 29 - Jan 8.
Scott & Armitage, April 1-3.
Koettlitz & Ferrar Jan 14 - 26.
Shackleton, Wilson, Ferrar Feb. 18 - 22.
Koettlitz & Bernacchi Sep 24 Oct 2.
Barne. Nov 1 - 23.
Armitage & Ferrar Sep. 10 - 24.
Scott, Shackleton, Skelton, Wilson Ferrar, Sep 2 - 5
Koettlitz & Skelton Nov 3 - 7.
Royds & Koettlitz Sep. 10 - 19.

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